

**From:** Whittaker, Laura [laura.whittaker@aptim.com]

**Sent:** Friday, September 21, 2018 12:34 PM

**To:** Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]

**CC:** Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Fowler, Janet CIV NAVSEA, SEA 04N [janet.fowler1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Amy Mangel [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]

**Subject:** [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY E2 (Use 12)

**Attachments:** HPNS APTIM RSY E2 (Use 12) Soil Non-LLRW Concurrence Request 09212018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.

**LAURA WHITTAKER**

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## Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013		
RSY Pad: E2	RSY Pad Use Number: USE 12	First Submittal <input checked="" type="checkbox"/> Second Submittal <input type="checkbox"/>
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 09/21/2018

Soil Sample Data					
Sample Identification	Survey Location	Type of Sample	<sup>226</sup> Ra Final Analytical Results (pCi/g)	<sup>137</sup> Cs Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.331
PE2-RSYE2-U12-S001	1	Systematic	0.746	-0.0605	0.0241
PE2-RSYE2-U12-S002	2	Systematic	0.0896	0.0324	N/A
PE2-RSYE2-U12-S003	3	Systematic	0.543	0.000805	N/A
PE2-RSYE2-U12-S004	4	Systematic	0.648	0.0250	N/A
PE2-RSYE2-U12-S005	5	Systematic	0.0405	0.00151	N/A
PE2-RSYE2-U12-S006	6	Systematic	0.620	-0.0586	N/A
PE2-RSYE2-U12-S007	7	Systematic	0.653	-0.0708	N/A
PE2-RSYE2-U12-S008	8	Systematic	0.620	0.0290	N/A
PE2-RSYE2-U12-S009	9	Systematic	0.427	-0.0674	N/A
PE2-RSYE2-U12-S010	10	Systematic	0.249	0.0193	N/A
PE2-RSYE2-U12-S011	11	Systematic	0.639	-0.0205	-0.00795
PE2-RSYE2-U12-S012	12	Systematic	0.444	-0.0484	N/A
PE2-RSYE2-U12-S013	13	Systematic	0.634	-0.0207	N/A
PE2-RSYE2-U12-S014	14	Systematic	0.653	-0.00164	N/A
PE2-RSYE2-U12-S015	15	Systematic	0.613	0.0310	N/A
PE2-RSYE2-U12-S016	16	Systematic	0.489	0.0193	N/A
PE2-RSYE2-U12-S017	17	Systematic	0.670	0.0473	N/A
PE2-RSYE2-U12-S018	18	Systematic	0.519	0.000096	N/A
LLRO Bounding Sample Data after removal of (LLRO #072618-1)					
PE2-RSYE2-U12-LLRO-S001	1	LLRO Bounding	0.514	0.0378	N/A
PE2-RSYE2-U12-LLRO-S002	2	LLRO Bounding	0.525	0.0228	N/A
PE2-RSYE2-U12-LLRO-S003	3	LLRO Bounding	0.682	-0.0367	N/A
PE2-RSYE2-U12-LLRO-S004	4	LLRO Bounding	0.443	-0.0290	N/A

<sup>226</sup>Ra Radium-226<sup>137</sup>Cs Cesium-137

Sr Strontium

pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-07242018-PE2-ROV2-2822	07/24/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	2,953-4,191* CPS
RSI Follow-up Static Survey	HPRS-07262018-PE2-JSS2-2836	07/26/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,146-4,630* CPS
Systematic Sample Survey	HPRS-07262018-PE2-JSS-2845	07/26/2018	2221	06/29/2019	117634	15,069 CPM	17,241 CPM	N/A	N/A	13,387-14,973 CPM
LLRO Bounding Sample Survey	HPRS-07262018-PE2-JSS-2846	07/26/2018	2221	06/29/2019	117634	15,069 CPM	17,241 CPM	N/A	N/A	13,917-14,375 CPM

+ Gamma readings exceeding the Reference Area 3σ IL—see Note(s) in the Summary table (page 2) for more details.

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
<p>1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).</p> <p>2) RSI Follow-up static survey—30 locations identified during the data review process were investigated. Follow-up location #28 exceeded the Reference Area static IL for regions of interest (ROIs) 6, 7, 8, and 10 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).</p> <p><u>Note:</u> During the follow-up investigation, a Low Level Radiological Object (LLRO) was identified at location #28 and removed (LLRO #072618-1). Once removed, a 2'x2' area was demarcated in the soil surrounding the LLRO location, and all soil within the over-excavation area was removed and controlled as LLRW. Bounding samples were then collected from the corners and final depth of 9" of the over-excavation area to confirm the removal of the elevated material. Follow-up static measurement taken at location #28 shows activity pre-remediation</p> <p>3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 43-66).</p> <p>Ten percent of the systematic soil samples (two samples in total, PE2-RSYE2-U12-S001 &amp; PE2-RSYE2-U12-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 43-66)</p> <p>4) LLRO Bounding Sample Survey— samples PE2-RSYE2-U12-LLRO-S001 through PE2- RSYE2-U12-LLRO-S004 were collected from the edges of the 2'x2' over-excavation area surrounding LLRO #072618-1 and submitted for gamma spectroscopy analysis. Bounding soil sample locations and the over-excavation area are shown on the Bounding Sample Survey map (page 9). TestAmerica sample results are attached (pages 67-80).</p> <p><u>Note:</u> After the extraction of LLRO #072618-1, additional characterization was performed with the RSI unit. Evaluation of the LLRO spectral data indicates the presence of <sup>226</sup>Ra. Spectral analysis results are provided for LLRO #072618-1 (page 40).</p> <p>All RSY material within the demarcated over-excavation area surrounding LLRO #072618-1 was removed and controlled as LLRW. Gamma Spectroscopy analysis results for bounding samples collected at the edges of the over-excavation are within project action limits.</p> <p><b>Conclusions:</b></p> <p><b>All locations with elevated Z-scores identified by the RSI gamma walkover survey were removed and controlled as a LLRW. 30 locations were investigated during the follow-up static survey, with one elevated reading exceeding the Reference Area static IL at location #22 where LLRO #072618-1 was identified. Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 10-39).</b></p> <p><b>Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 41-42). Ten percent of the systematic soil samples (two samples in total, PE2-RSYE2-U12-S001 &amp; PE2-RSYE2-U12-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).</b></p> <p><b>RSY E2 (Use 12) contains soil from French Drain construction along North Perimeter Survey Units 01-05 excavation areas (NP-01-NP-05).</b></p> <p><b>APTIM request RASO concurrence to release this soil as Non-LLRW.</b></p> <p><b>Disposition: This soil shall be dispositioned as non-LLRW waste to be stockpiled onsite following appropriate chemical characterization.</b></p>

## RSI Data Evaluation Process

### RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
  - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ( $Z > 3$ ) is marked for follow-up.
  - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local  $Z > 3$  is marked for follow-up.
  - **Semi-local Z-Scores:** Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local  $Z > 3$  is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
  - **Z-Scores:** The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a  $Z > 3$  is marked for follow-up.
  - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local  $Z > 3$  is marked for follow-up.
  - **Semi-local Z-Scores:** Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local  $Z > 3$  is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a  $Z > 3$  is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local  $Z > 3$  is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local  $Z > 3$  is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a  $Z > 3$  is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local  $Z > 3$  is marked for follow-up.
  - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local  $Z > 3$  is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score  $> 3$  in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

LC = critical level (counts)  
 B = average background in the ROI

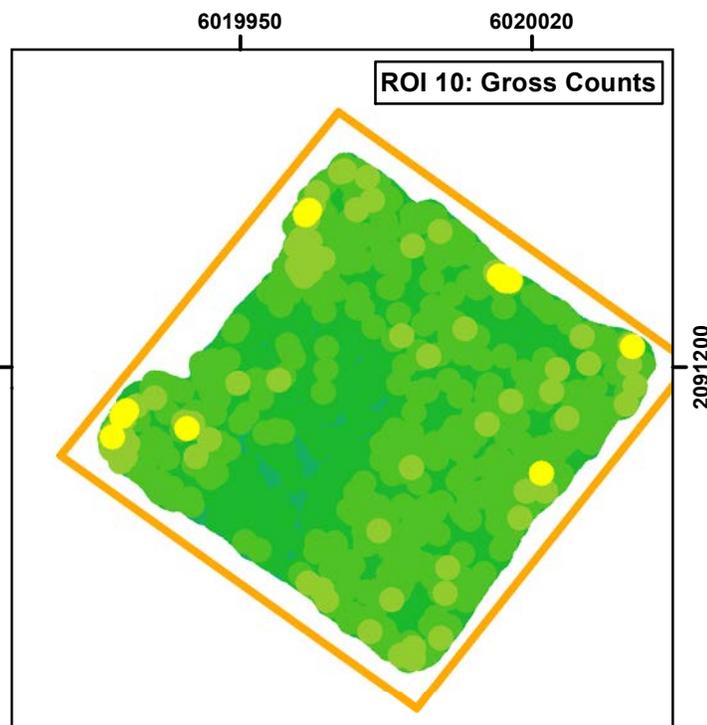
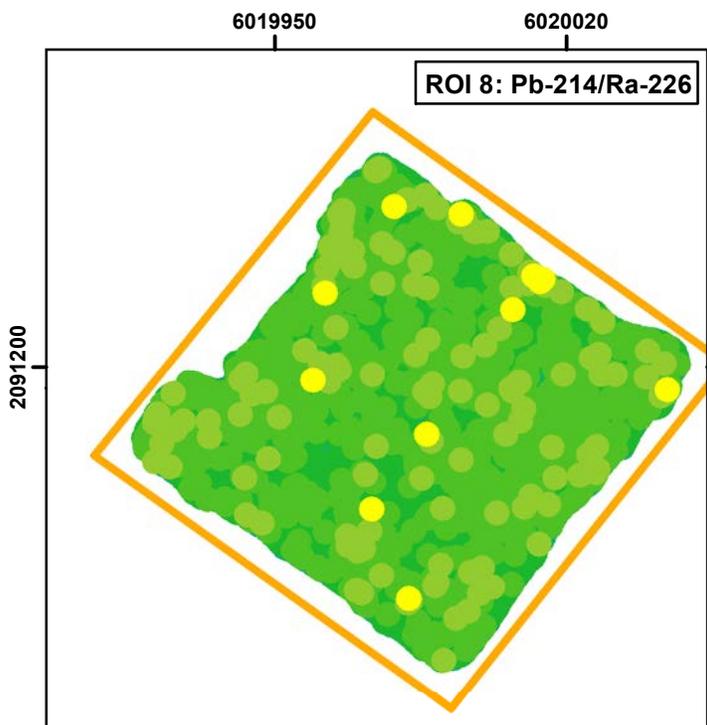
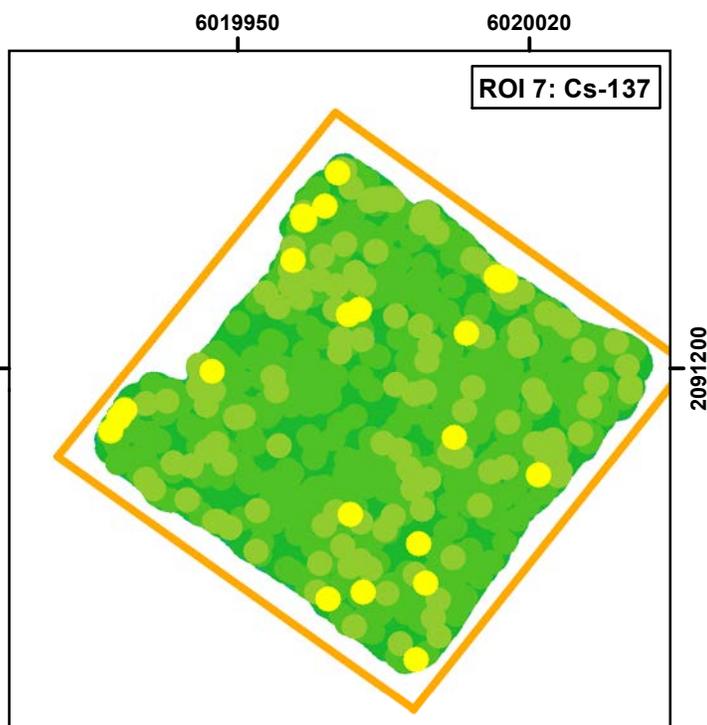
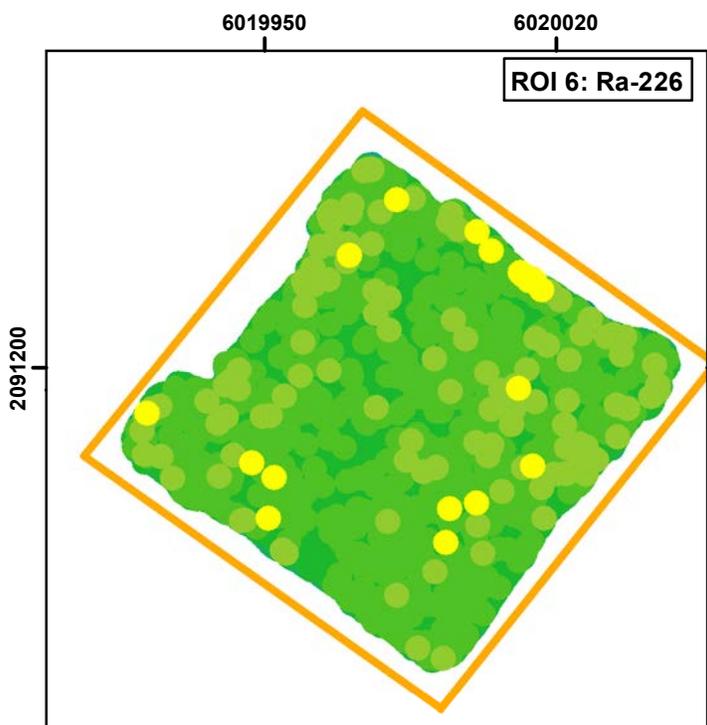
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

# HPNS Parcel E-2 RSY Pad E2 (Use 12)

Soil Excavation Site:  
NP-01 to NP-05 French Drain

Contour Map



### RS-700 Gamma Walkover Survey Data (VD1)

- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

RSY Pad Boundary



Coordinate system: CSP Zone III, NAD83, US Survey Foot



## RSI Review Summary

### Summary:

30 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of  $^{226}\text{Ra}$  or  $^{137}\text{Cs}$  above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 10; figures are provided on pages 9-38.

# HPNS Parcel E-2 RSY Pad E2 (Use 12)

6019950

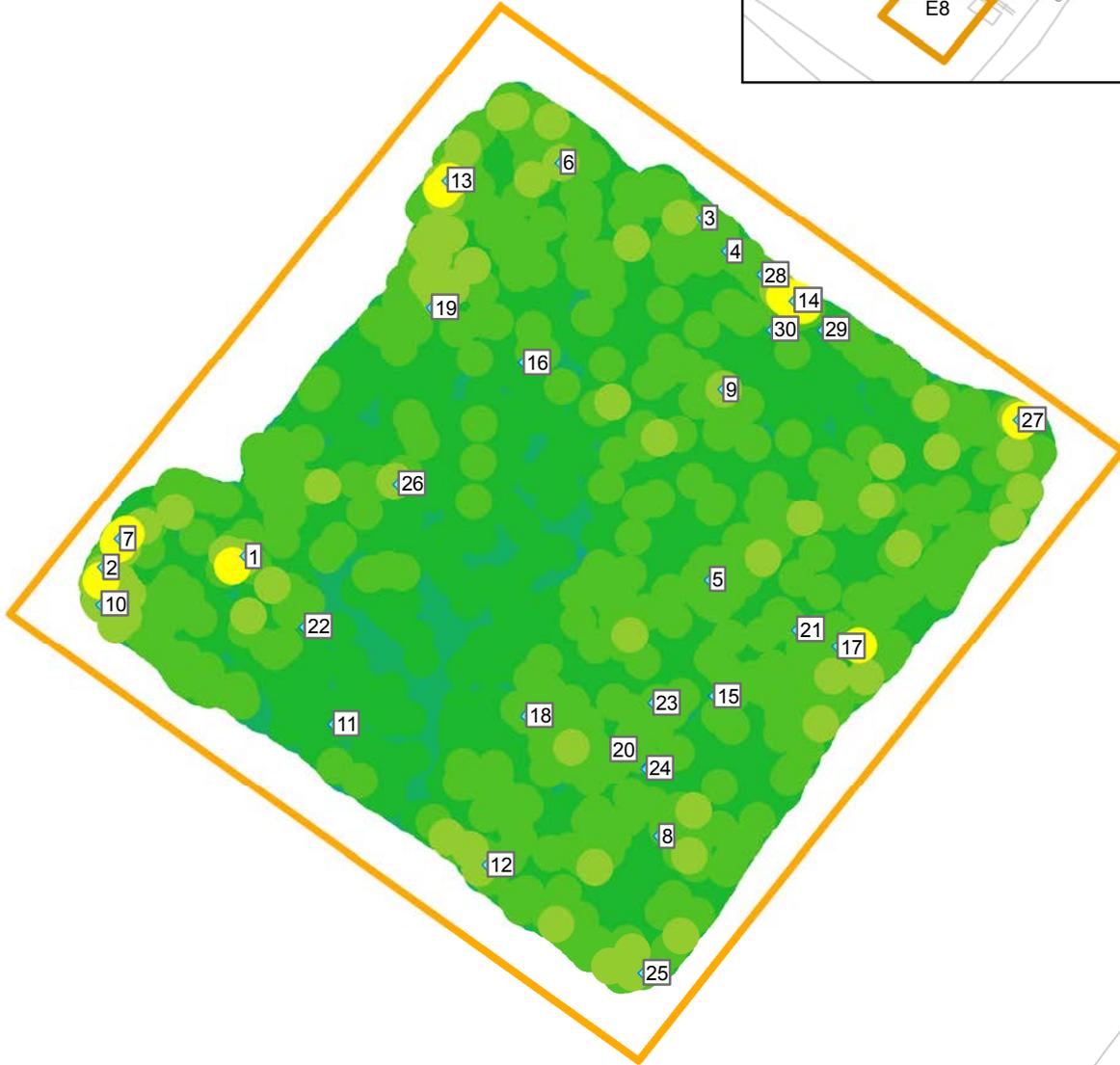
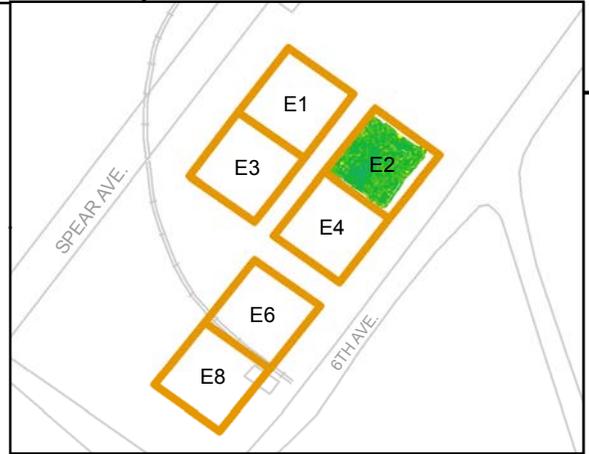
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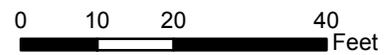
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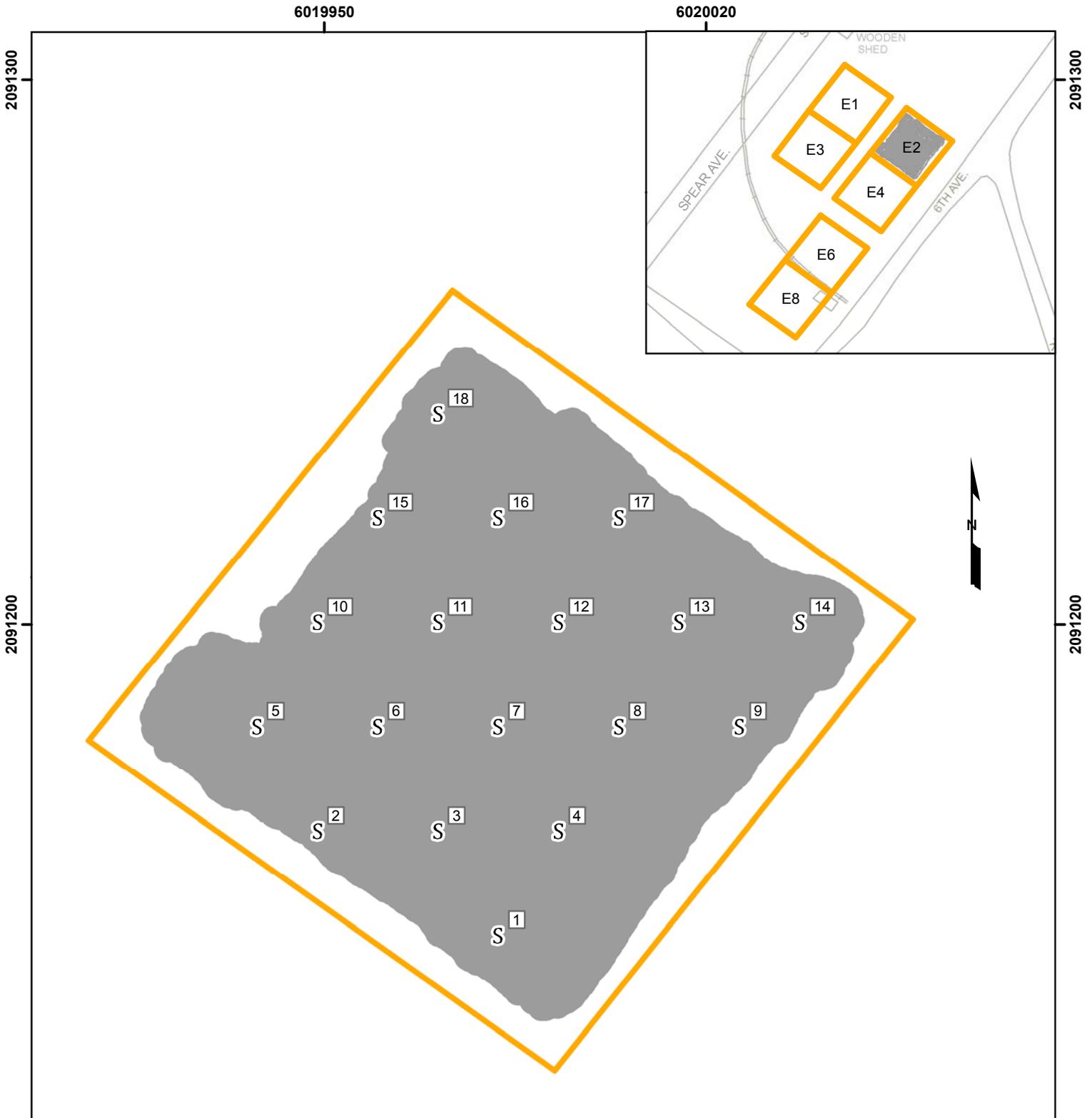
**RS 700 Gamma Walkover Survey Data (VD1, ROI 10)**

- ◆ Follow-up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- ▭ RSY Pad Boundary



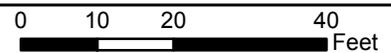
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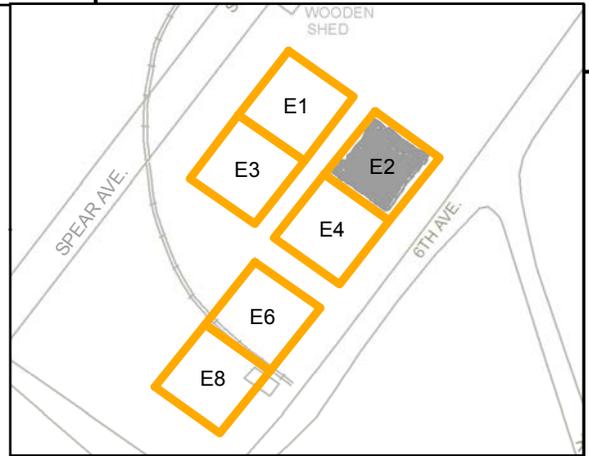
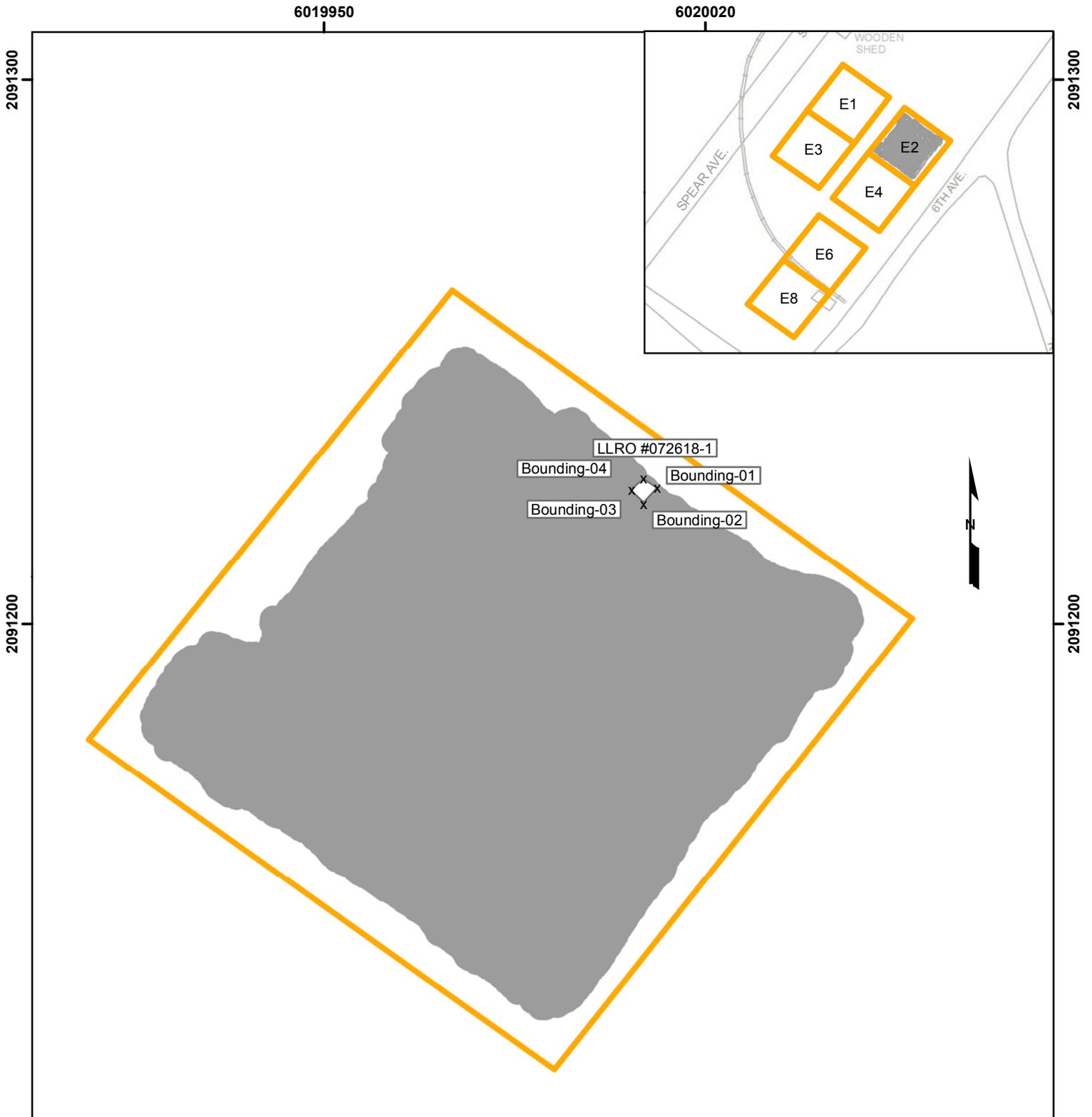
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**Serial Number: 117634**

- S Systematic Sample Locations
- RS-700 GWS Scan Coverage
- ▭ RSY Pad Boundary



Coordinate system: CSP Zone III. NAD83, US Survey Foot





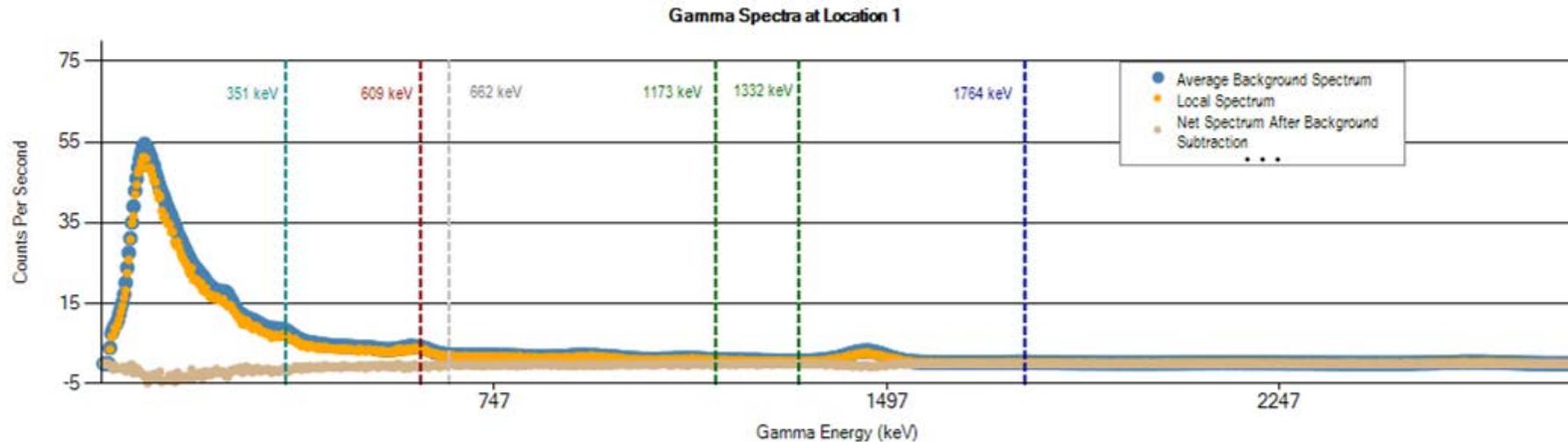
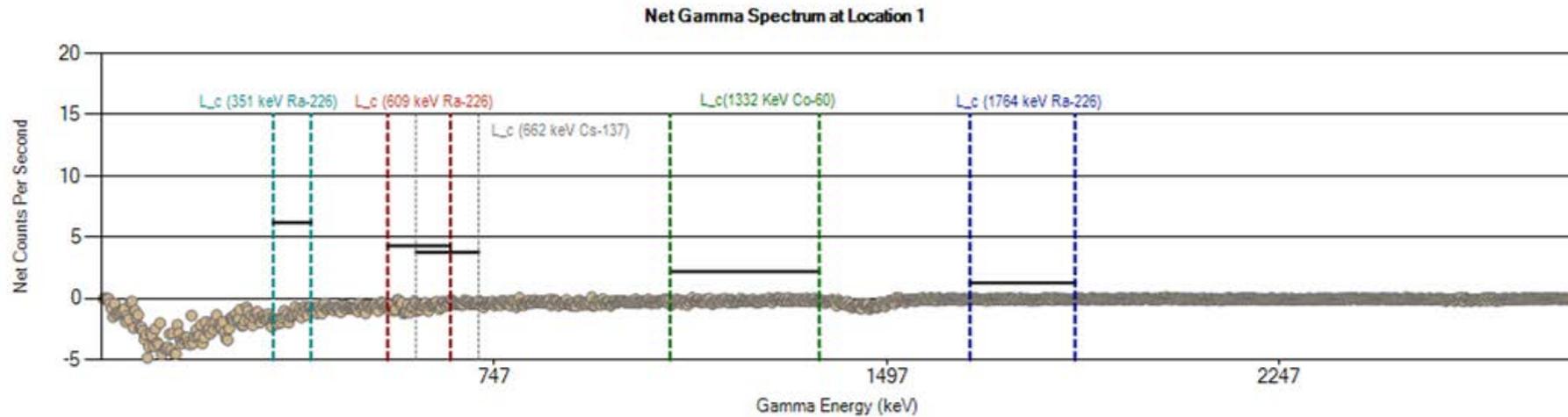
**Survey Instrument: Model 2221/ 44-20**  
**Serial Number: 117634**

- x Bounding Locations
- ◇ Excavation Location
- RS-700 GWS Scan Coverage
- ▭ RSY Pad Boundary

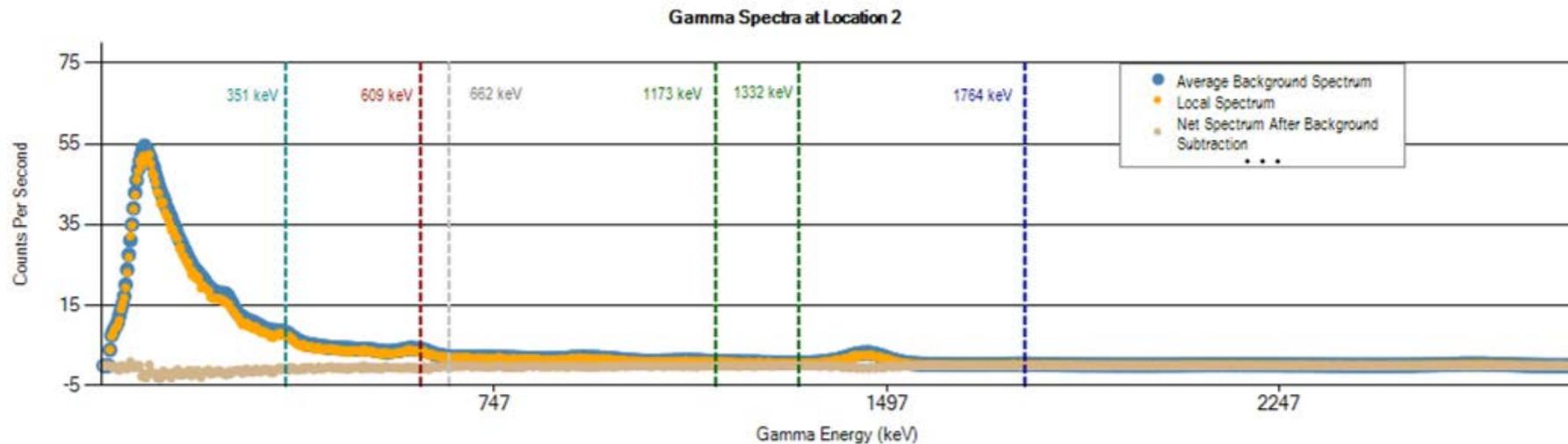
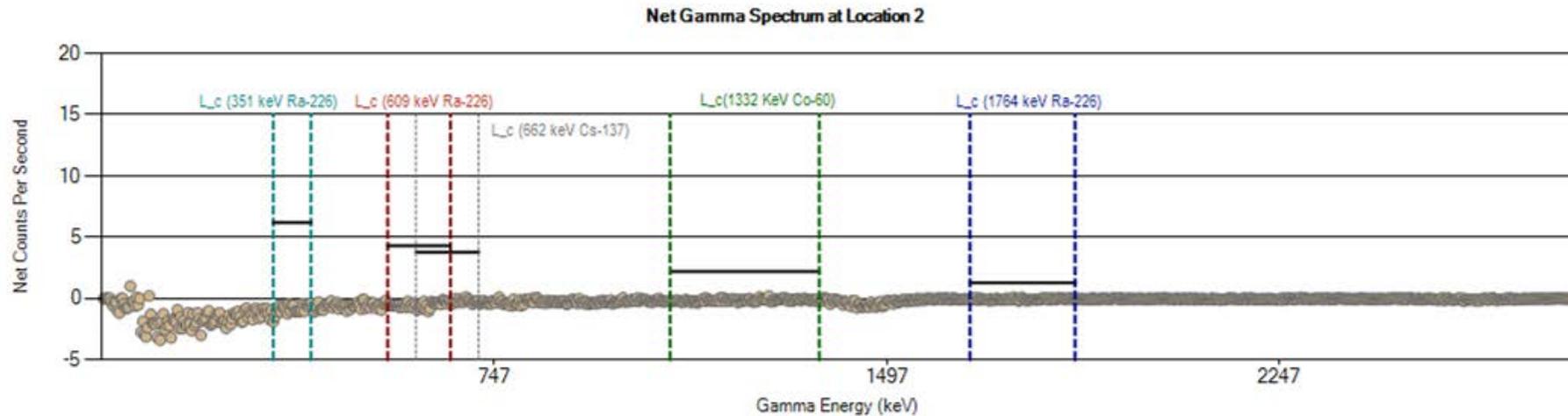
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Coordinate system: CSP Zone III. NAD83, US Survey Foot



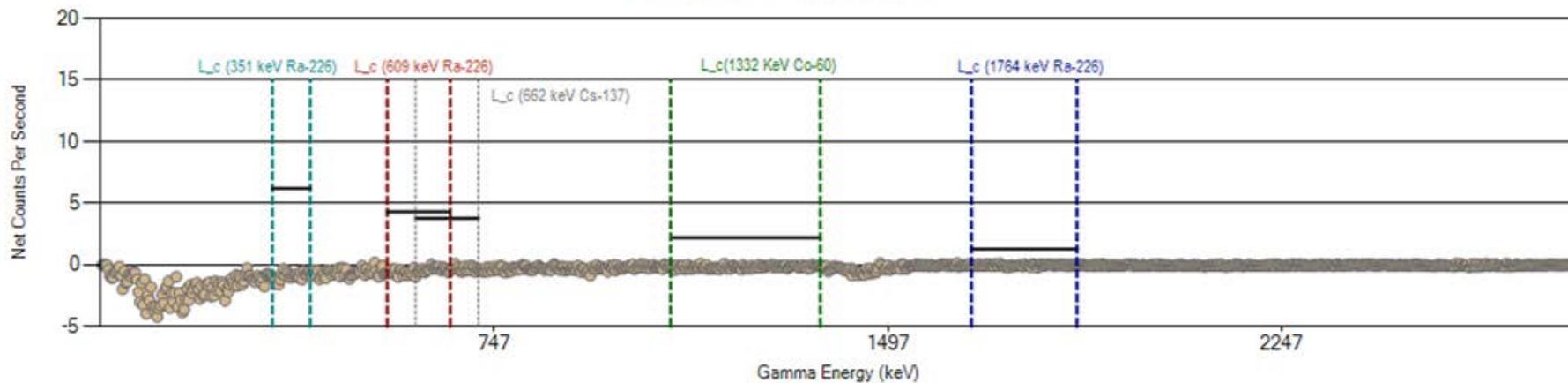


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	702	92	17	20	127	117	88	142	72	3182
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

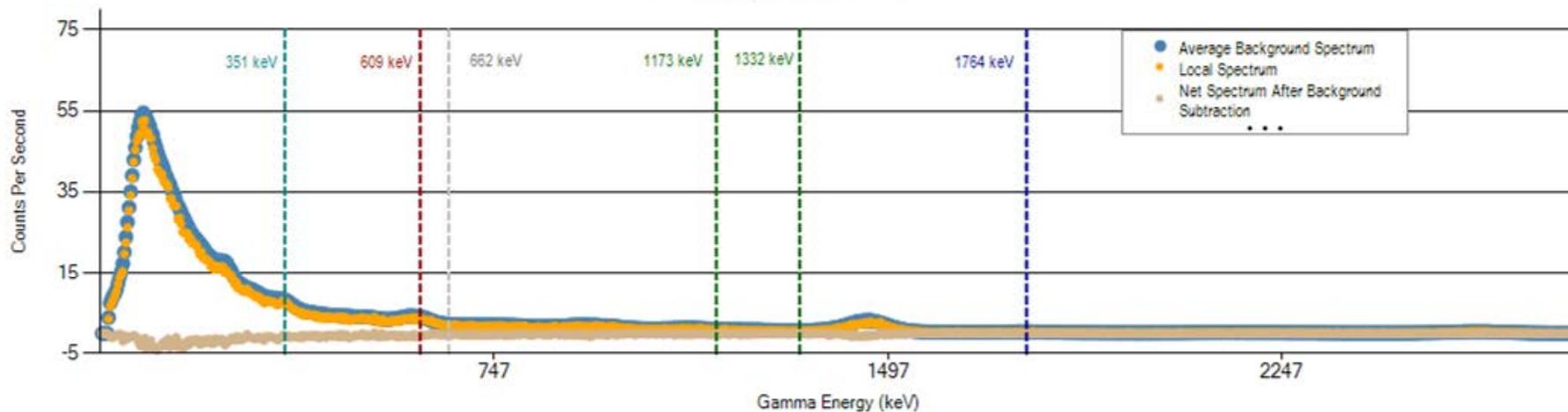


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	732	95	17	20	130	120	93	154	77	3313
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

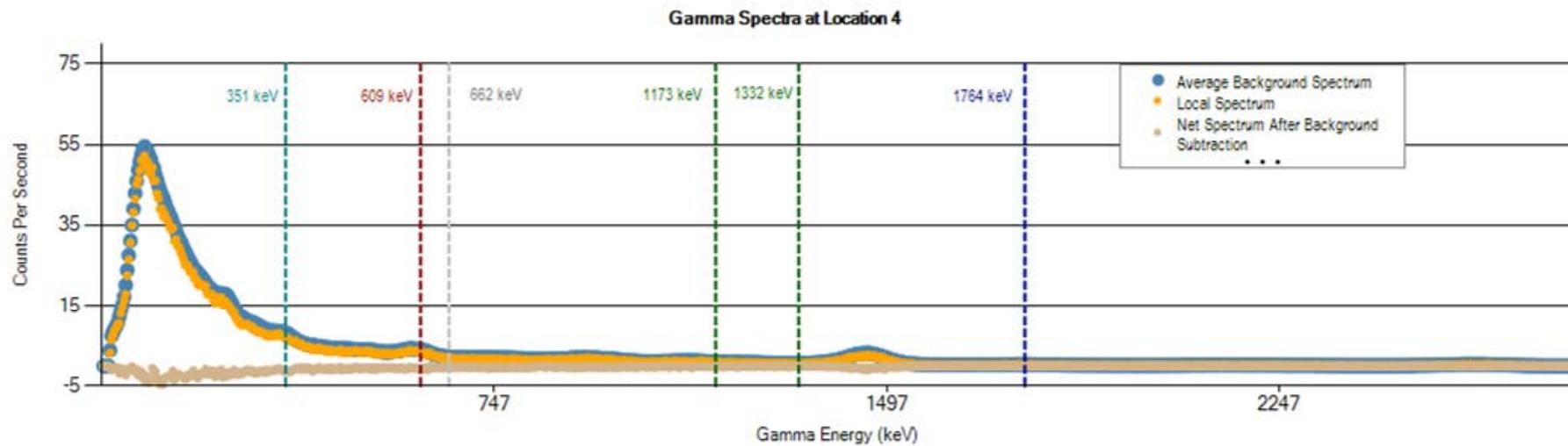
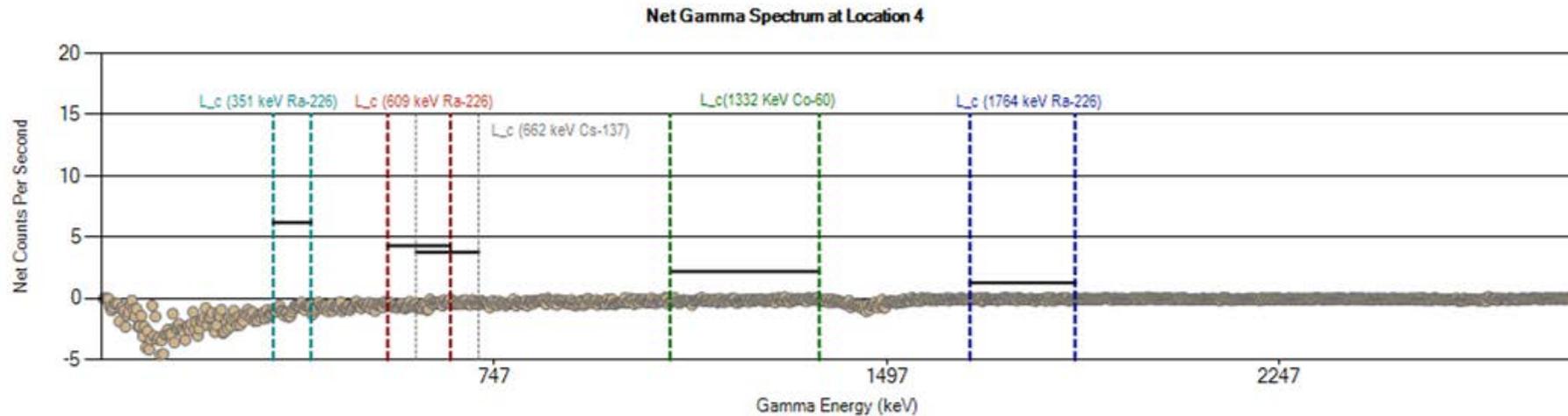
Net Gamma Spectrum at Location 3



Gamma Spectra at Location 3

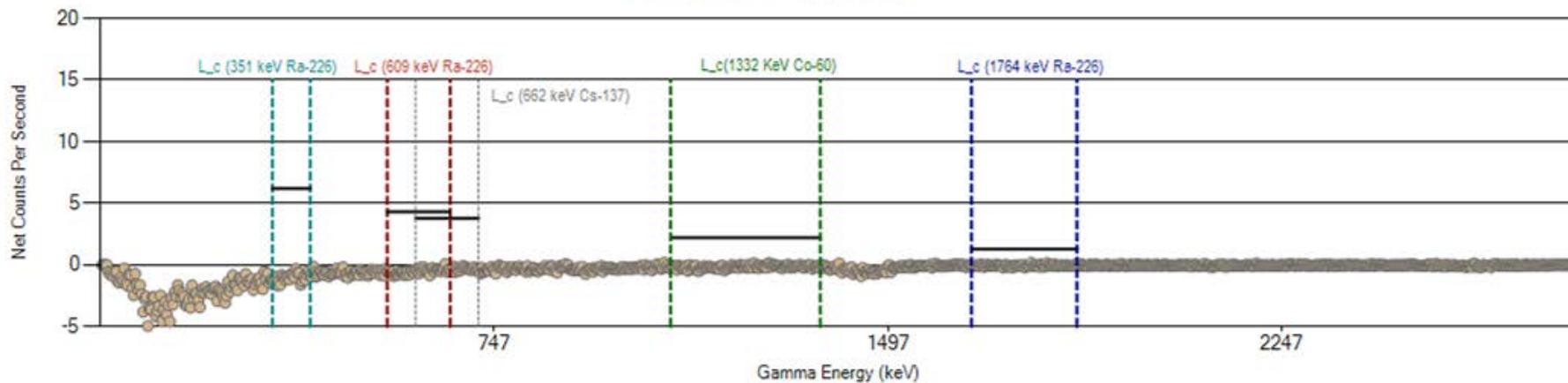


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	724	95	18	21	130	121	93	152	73	3273
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

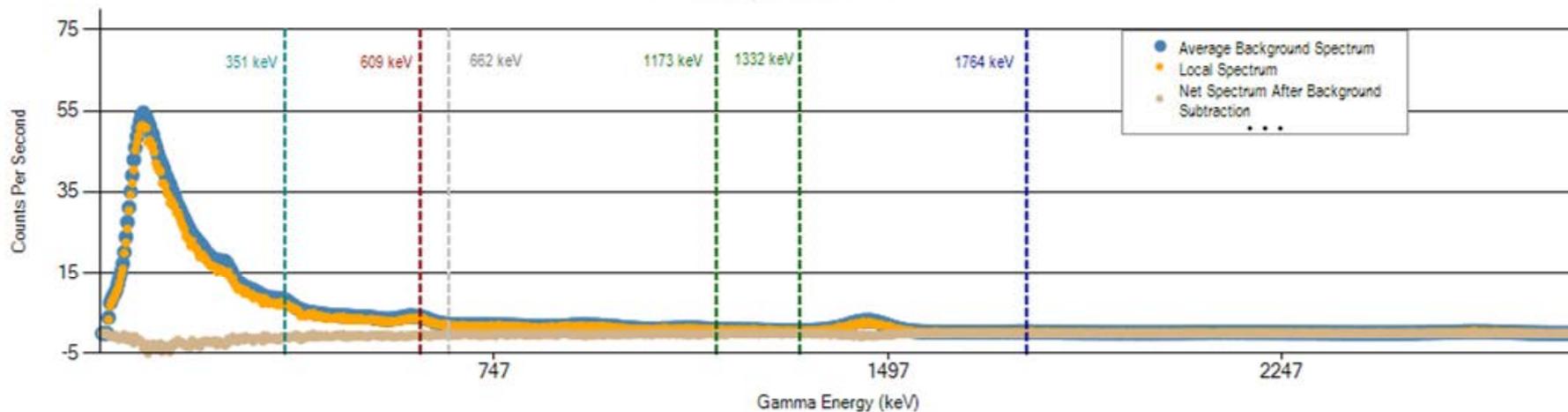


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	714	93	17	18	129	119	91	152	75	3248
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

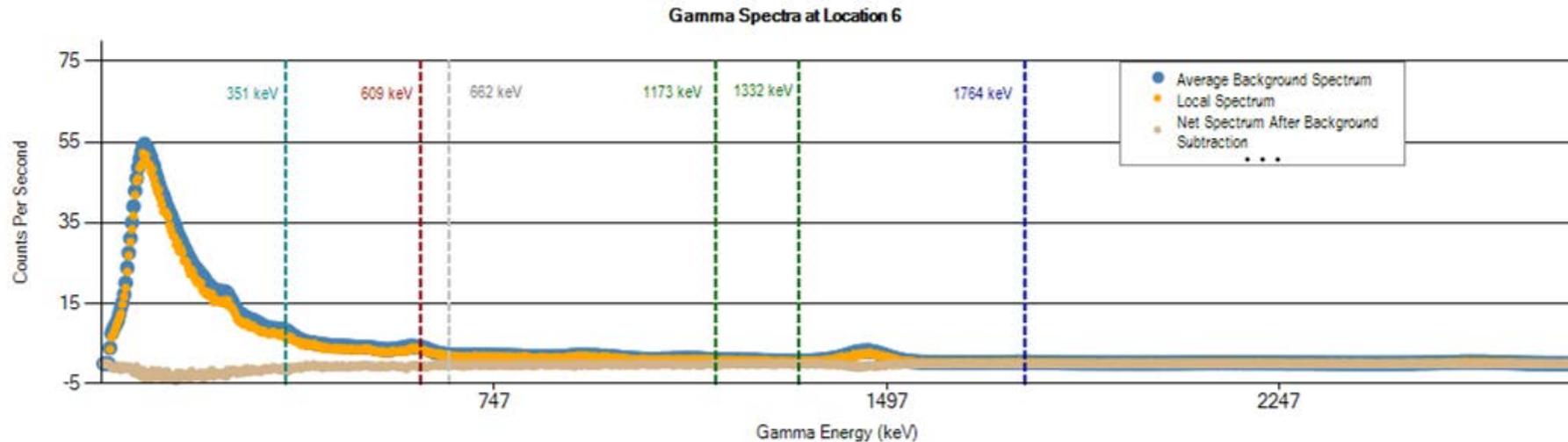
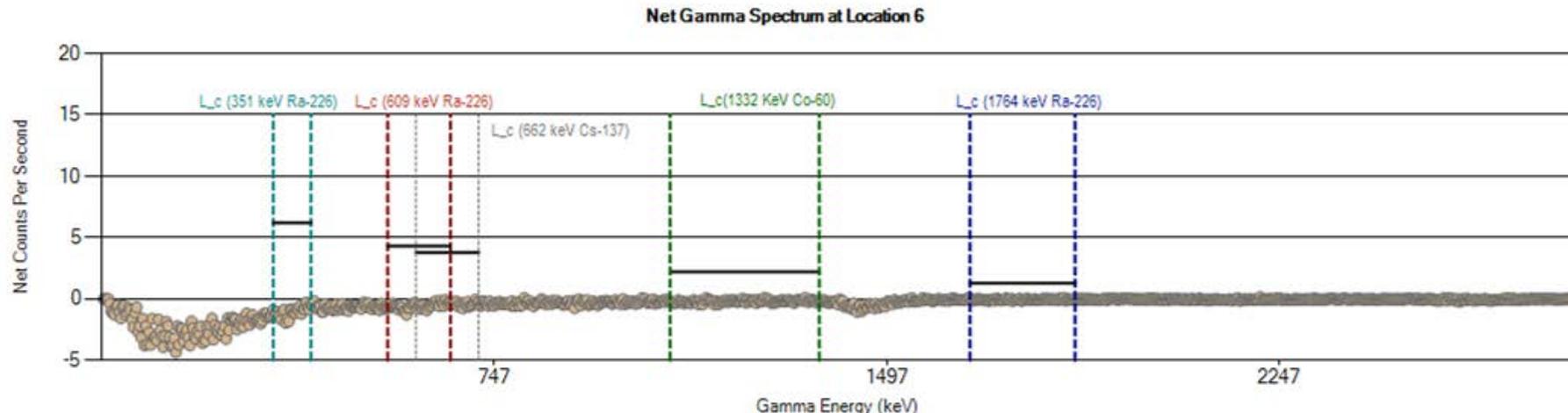
Net Gamma Spectrum at Location 5



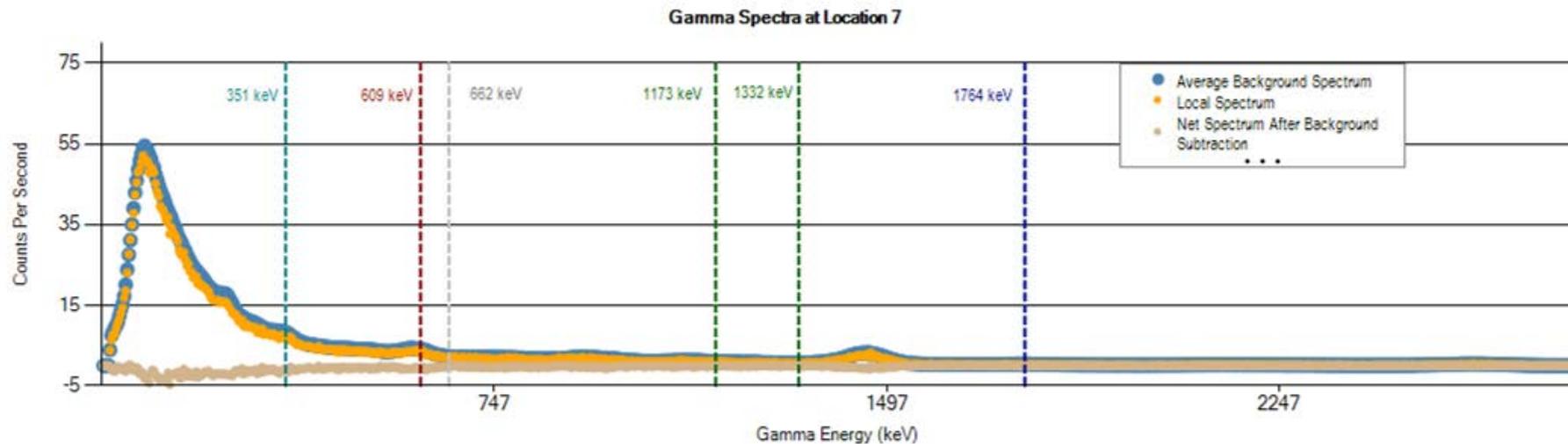
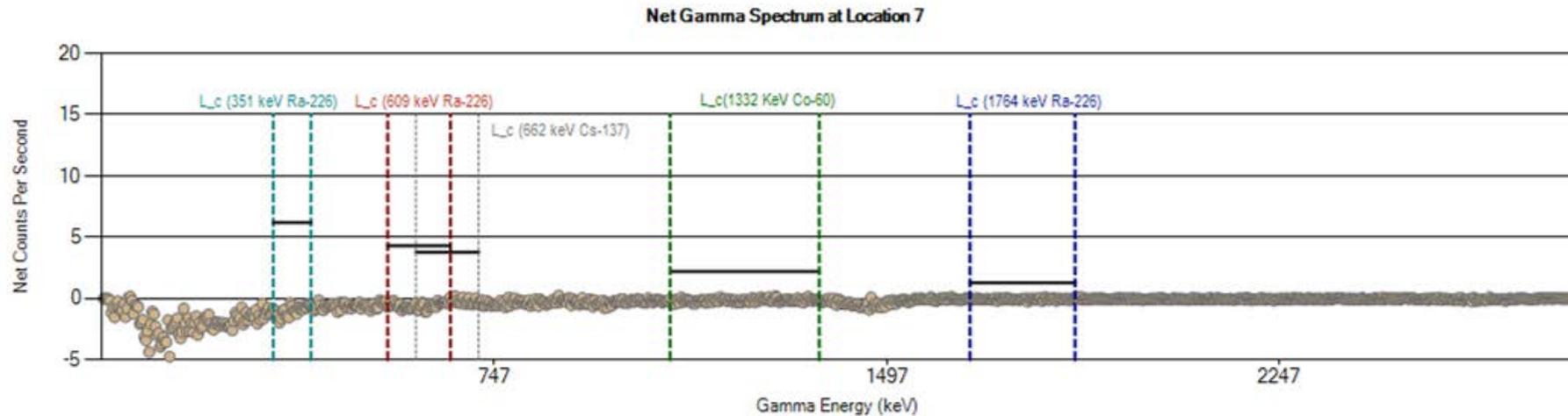
Gamma Spectra at Location 5



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	715	93	17	20	127	119	92	149	74	3229
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

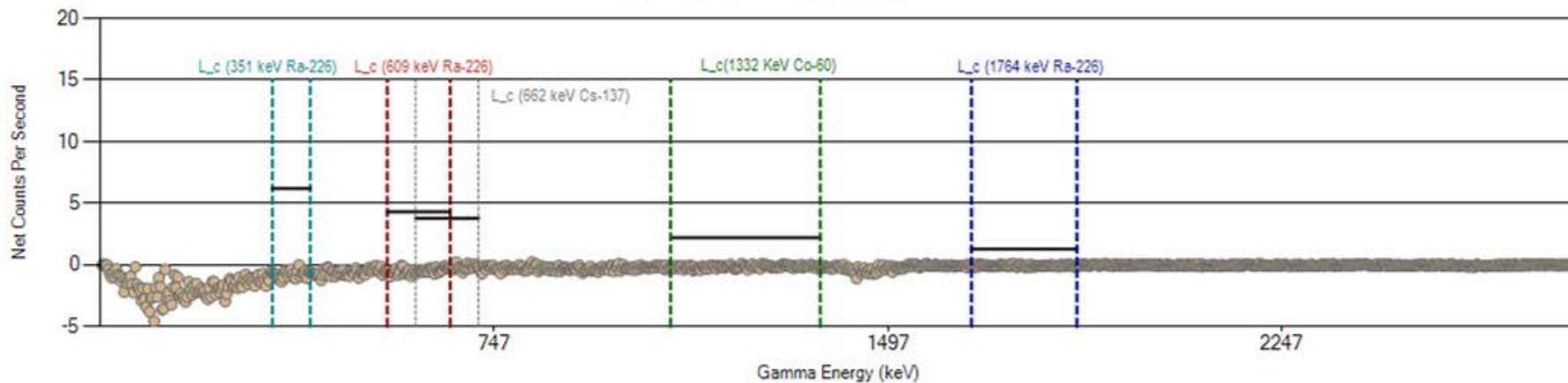


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	702	91	17	20	126	117	89	148	71	3204
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

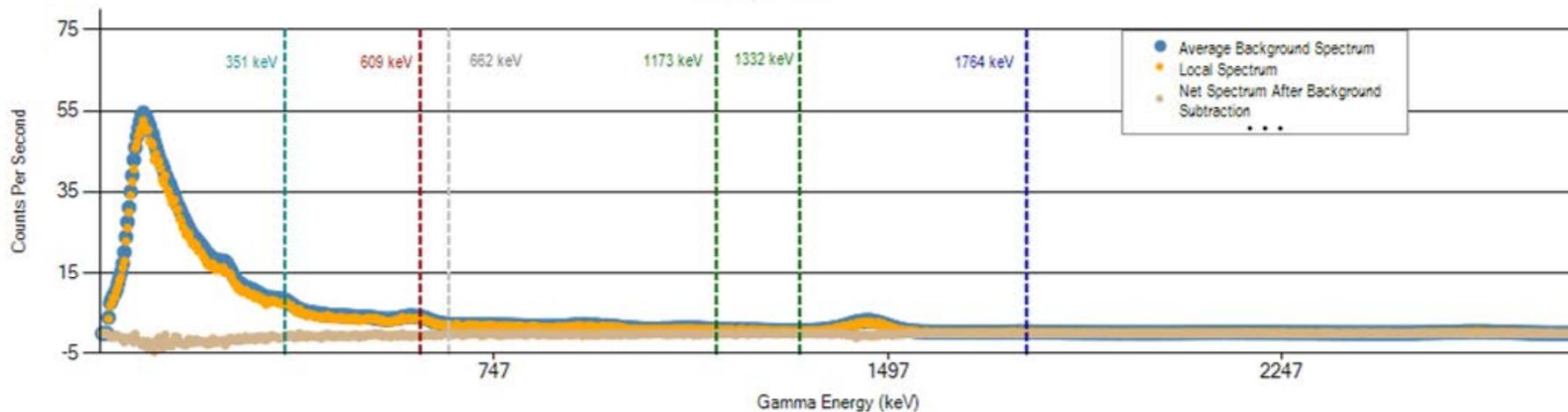


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	720	94	18	20	130	118	92	149	75	3262
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 8

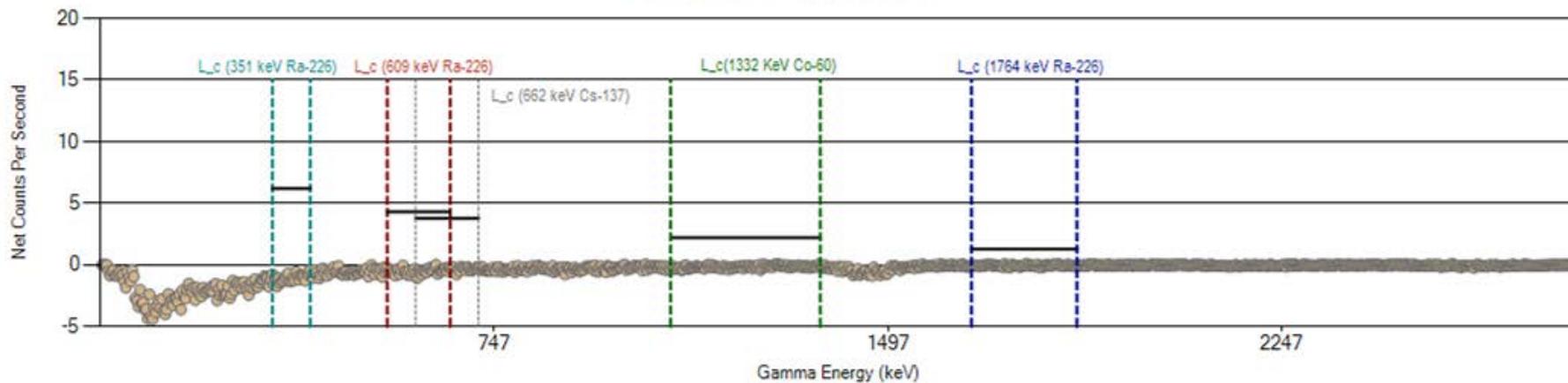


Gamma Spectra at Location 8

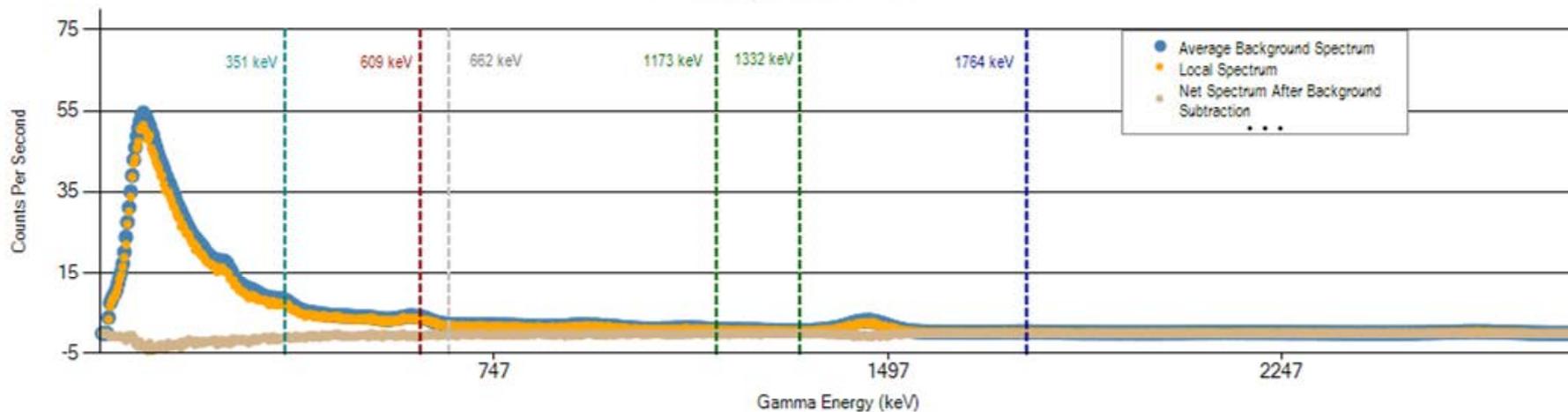


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	731	97	17	21	130	121	95	155	74	3282
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

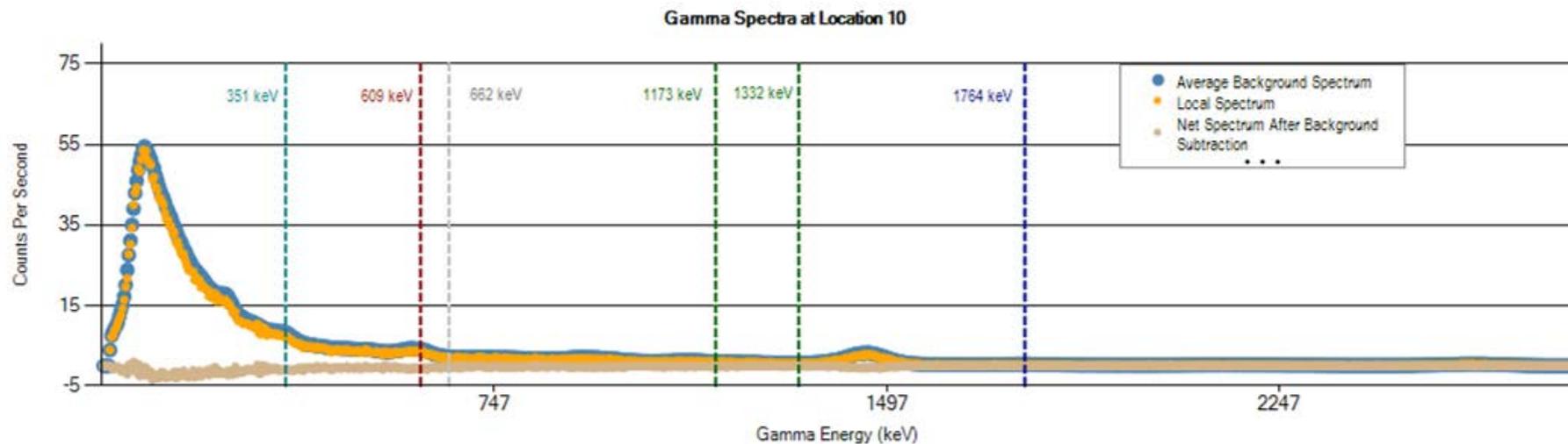
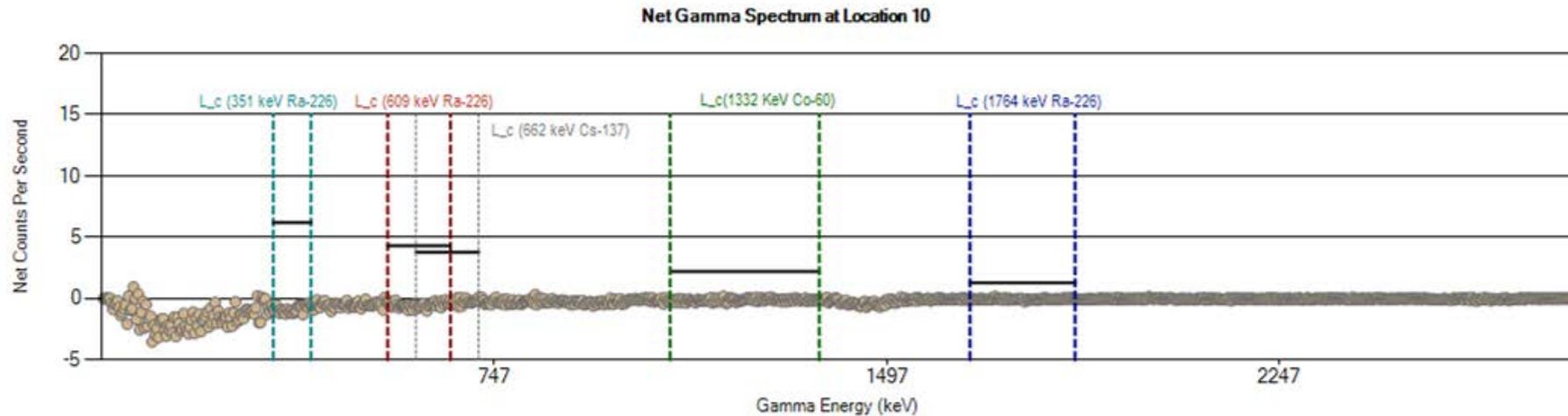
Net Gamma Spectrum at Location 9



Gamma Spectra at Location 9

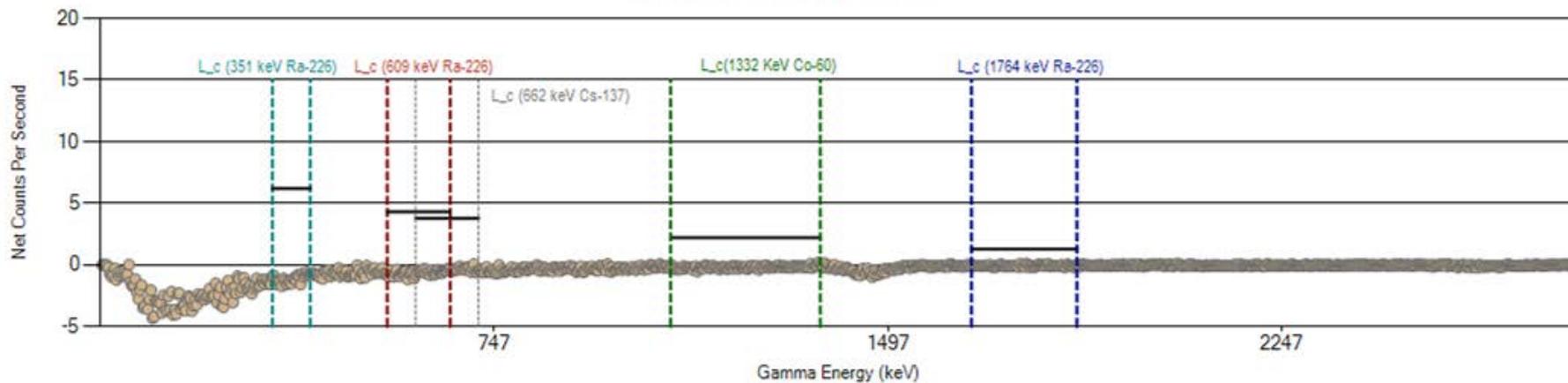


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	717	91	17	19	130	121	92	148	74	3227
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

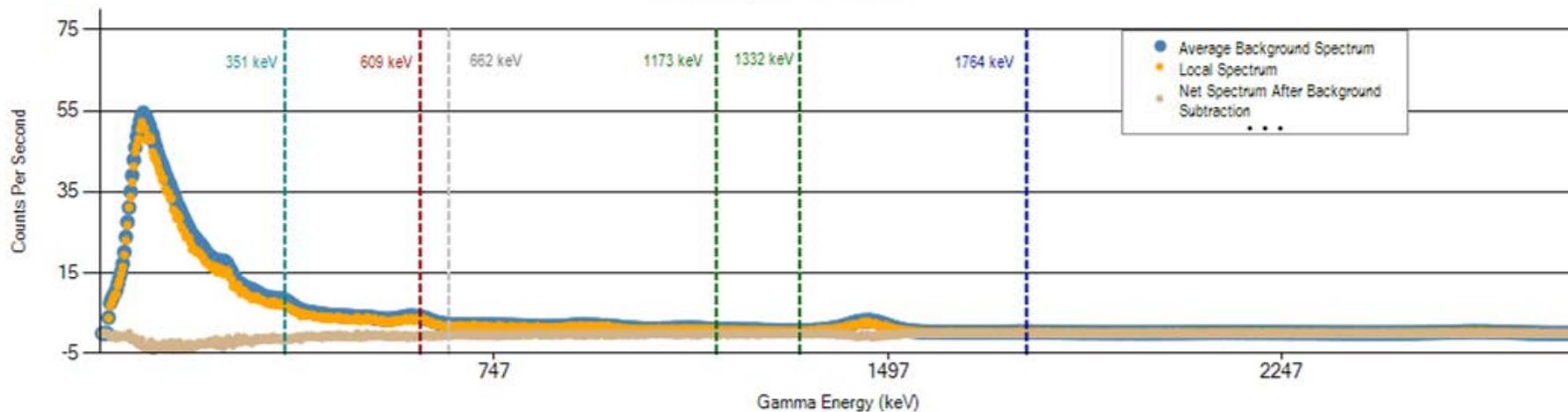


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	740	98	18	21	133	119	92	153	78	3321
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 11

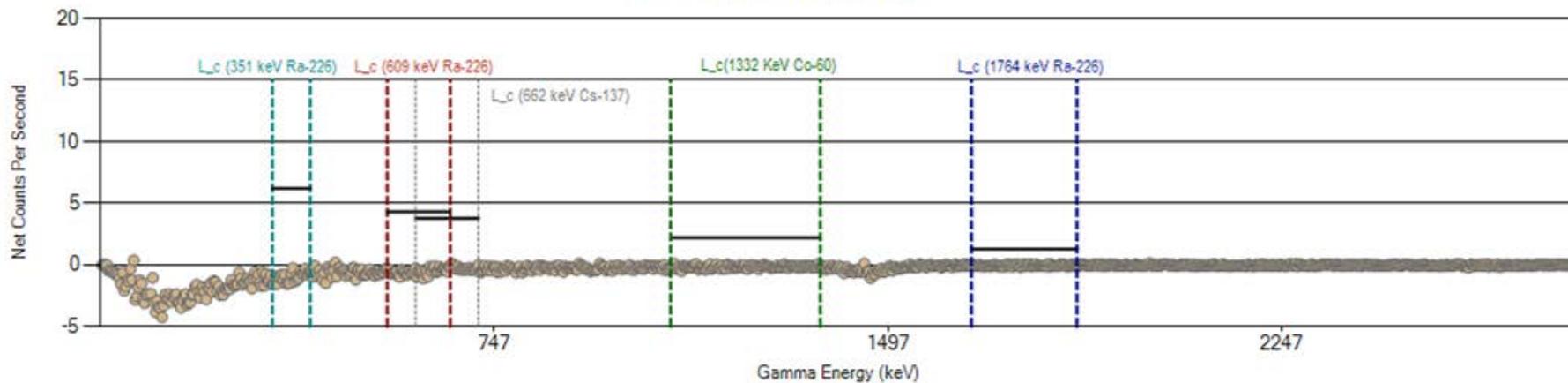


Gamma Spectra at Location 11

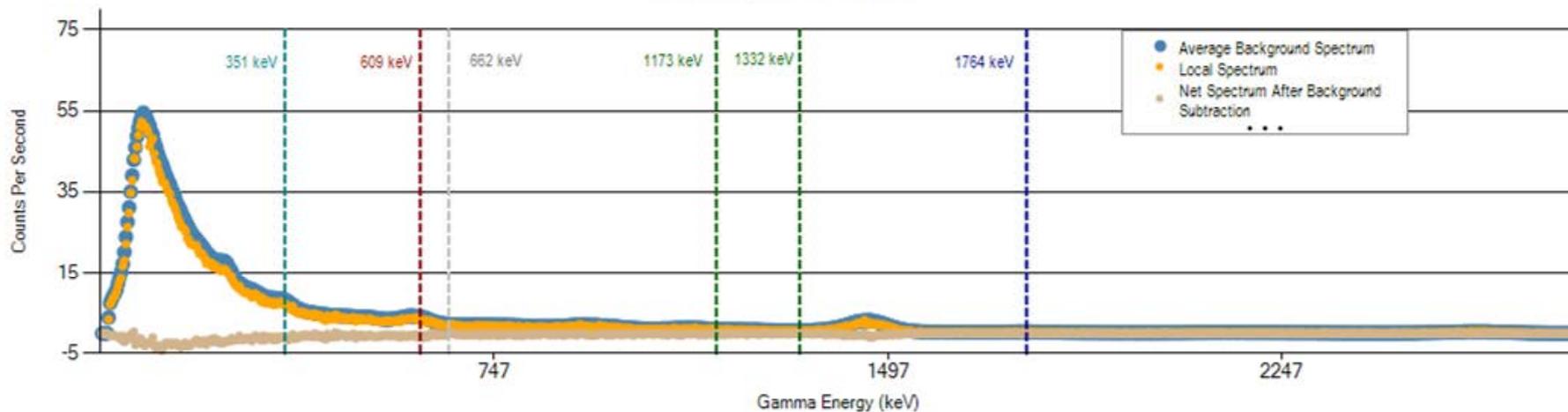


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	700	92	16	19	126	115	89	146	72	3193
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 12

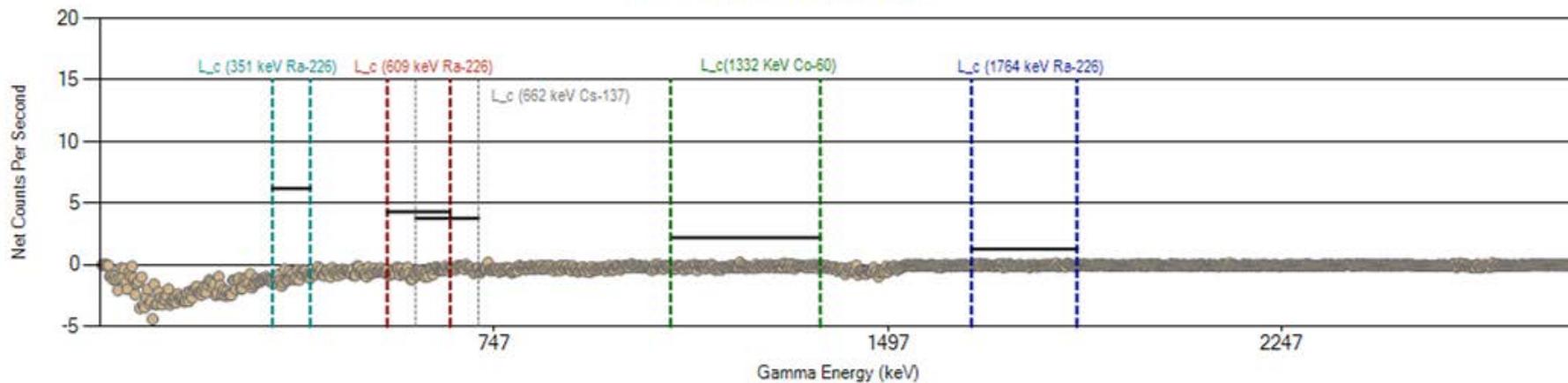


Gamma Spectra at Location 12

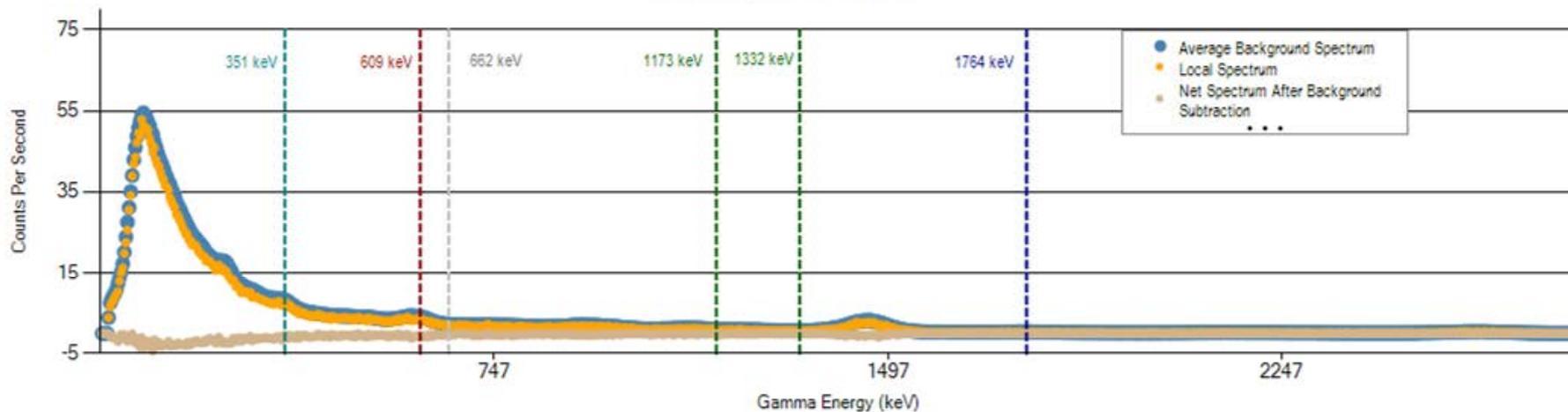


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	721	94	17	21	128	119	92	151	74	3253
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 13

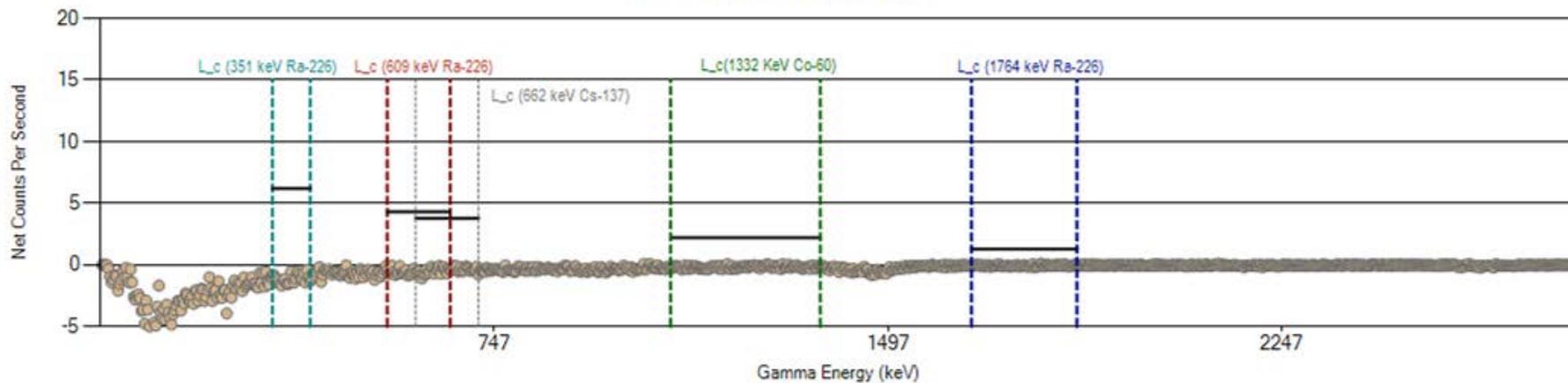


Gamma Spectra at Location 13

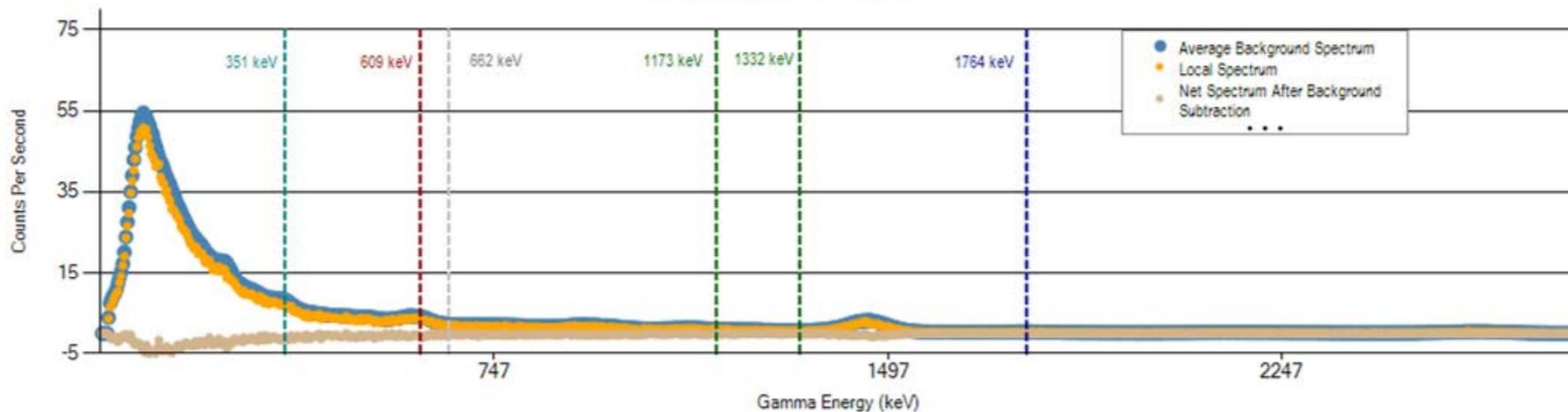


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	723	95	17	20	131	118	91	151	74	3257
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

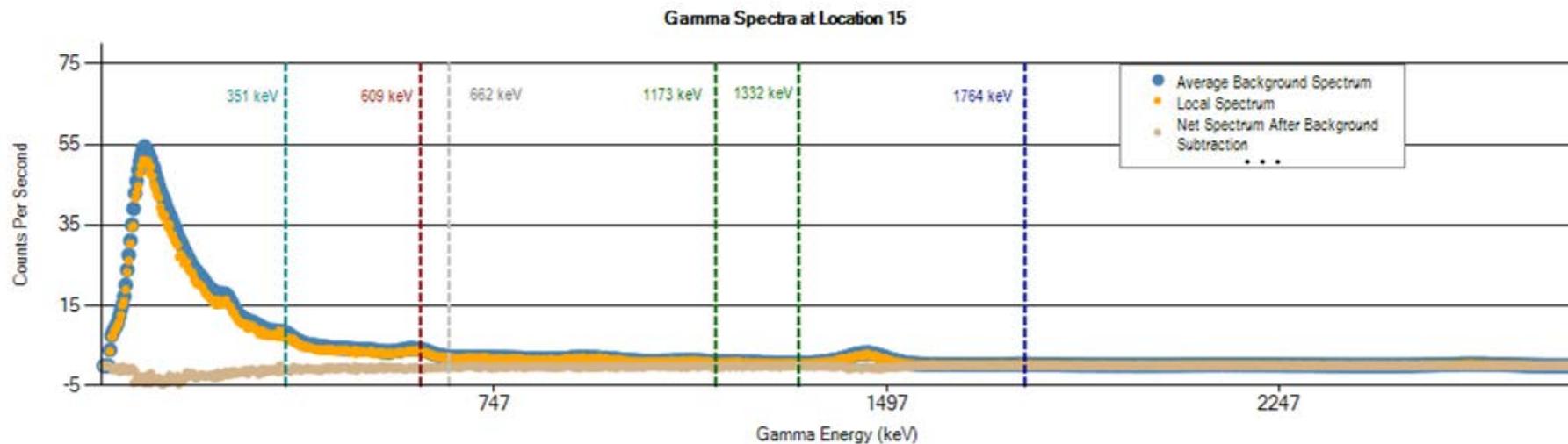
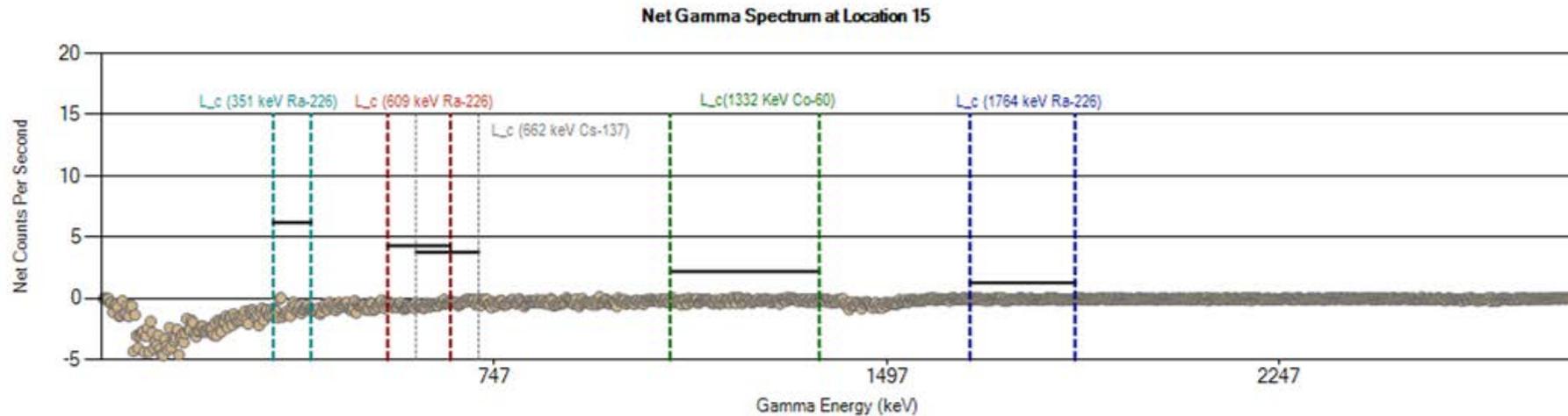
Net Gamma Spectrum at Location 14



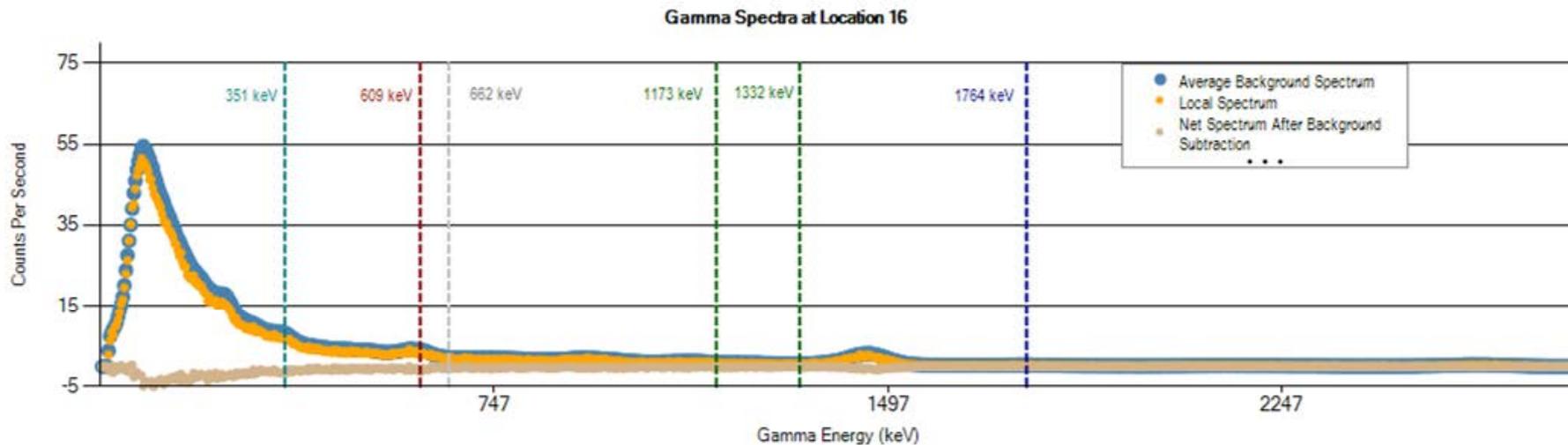
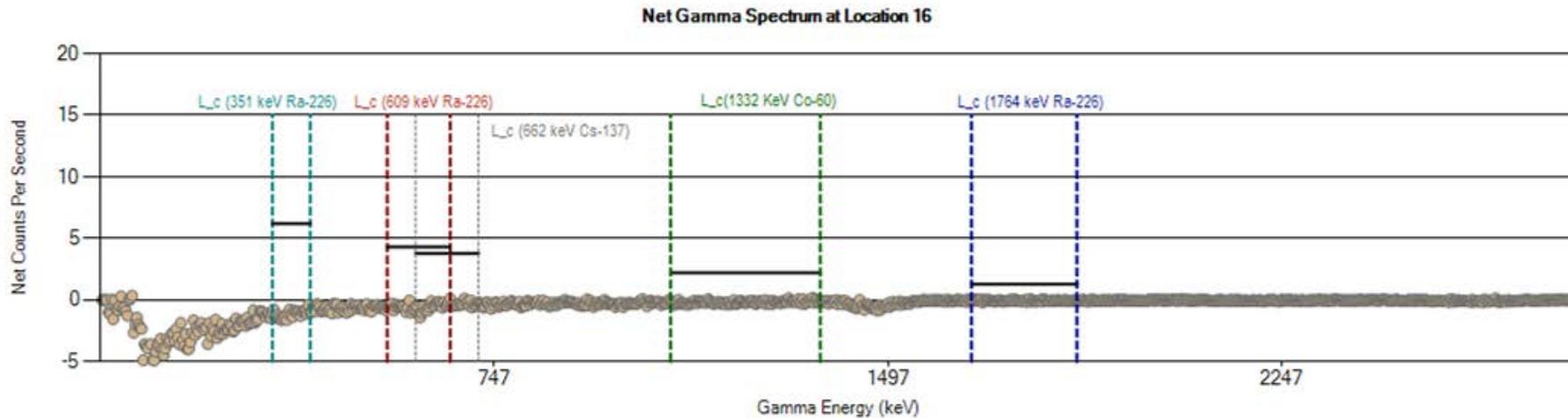
Gamma Spectra at Location 14



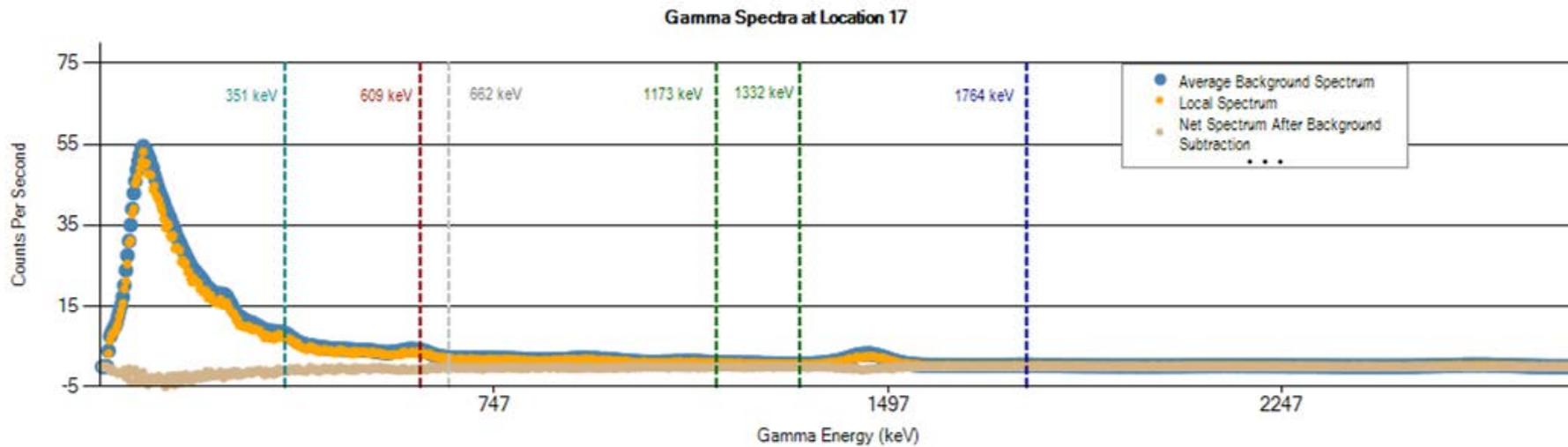
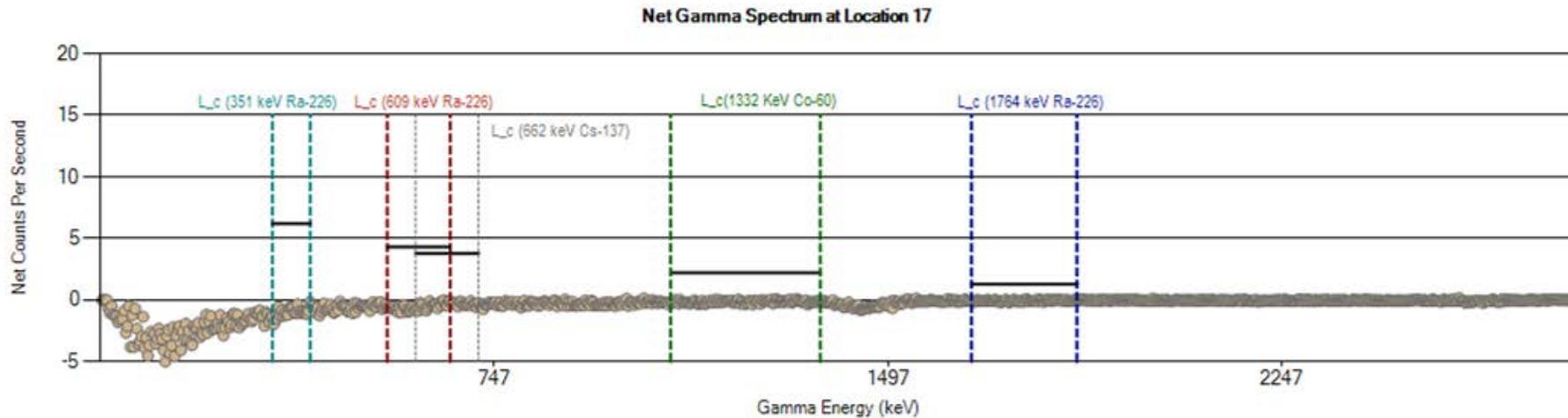
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	705	92	17	20	127	119	90	146	72	3187
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	712	92	17	20	128	119	92	152	73	3213
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

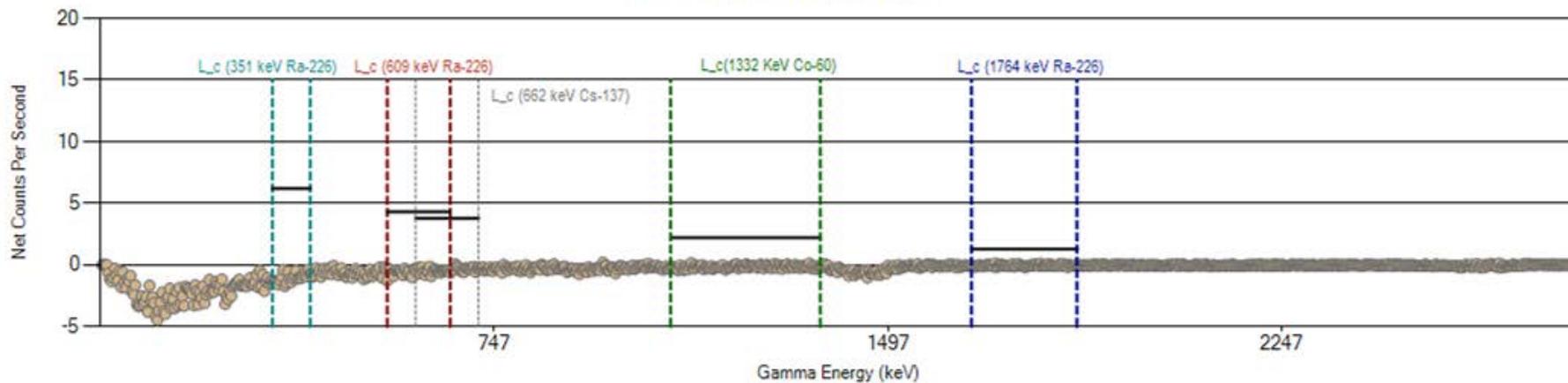


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	712	94	17	19	128	118	90	146	72	3204
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

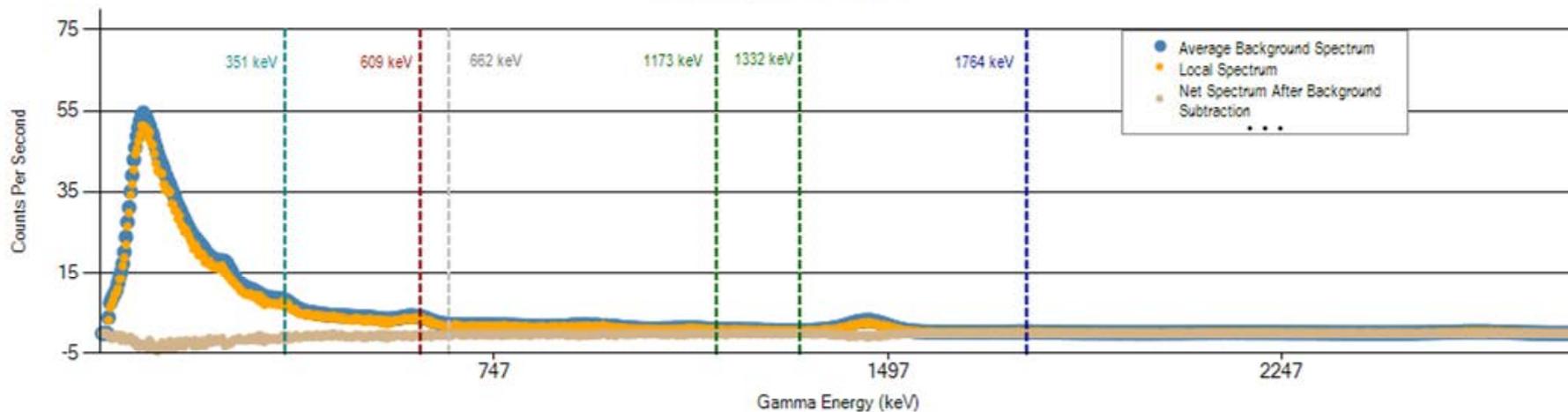


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	718	93	17	20	129	118	92	151	75	3216
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 18

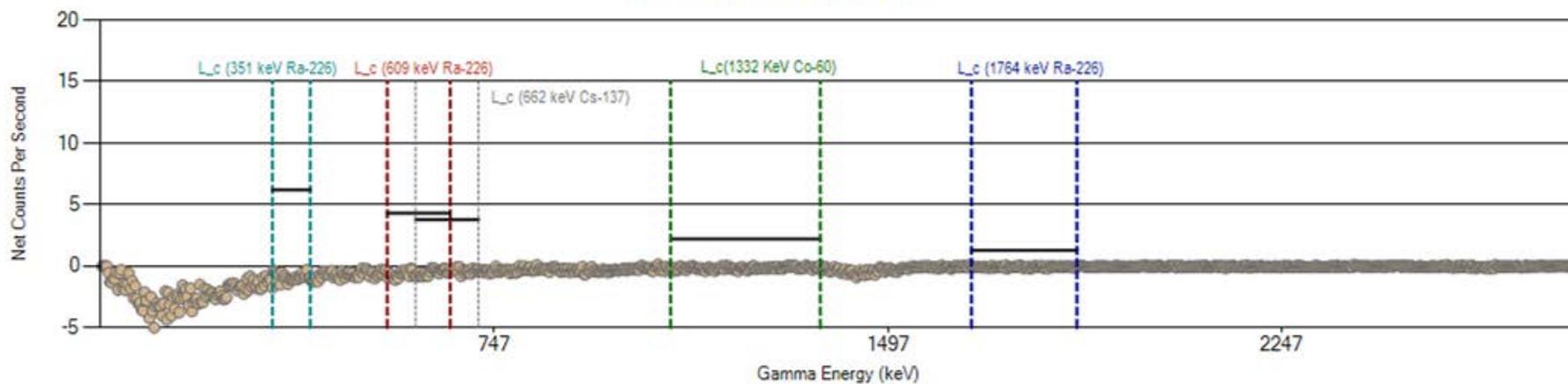


Gamma Spectra at Location 18

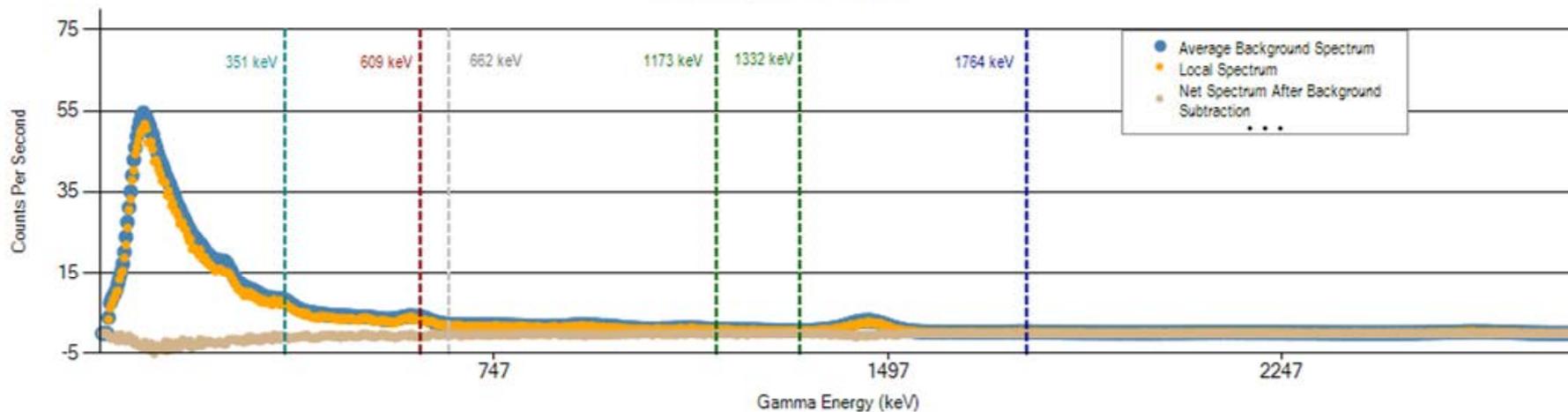


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	715	91	17	19	126	119	91	149	74	3228
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

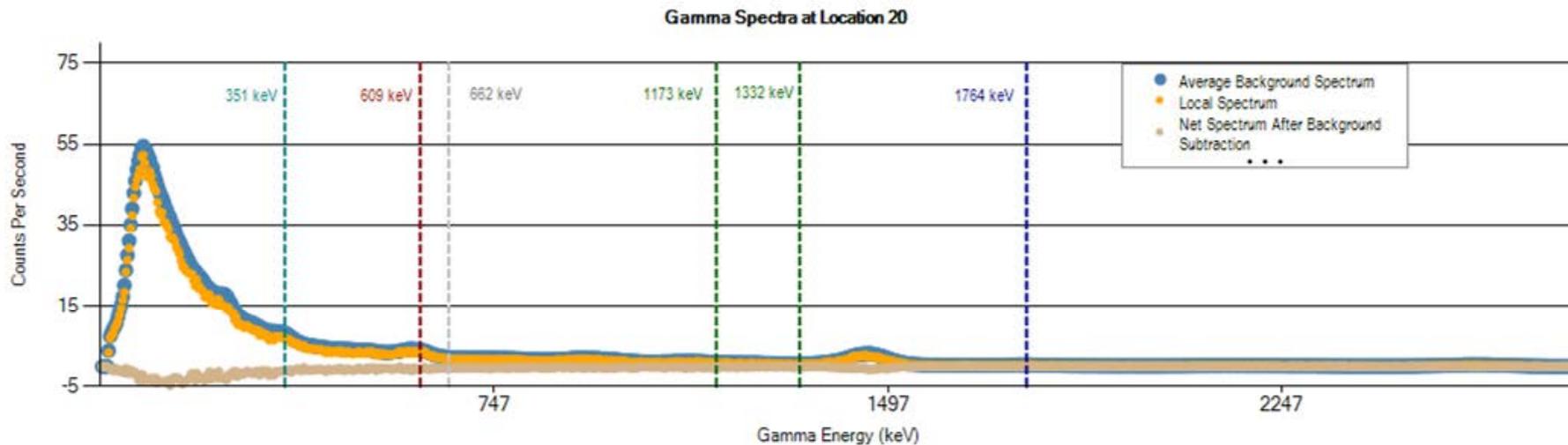
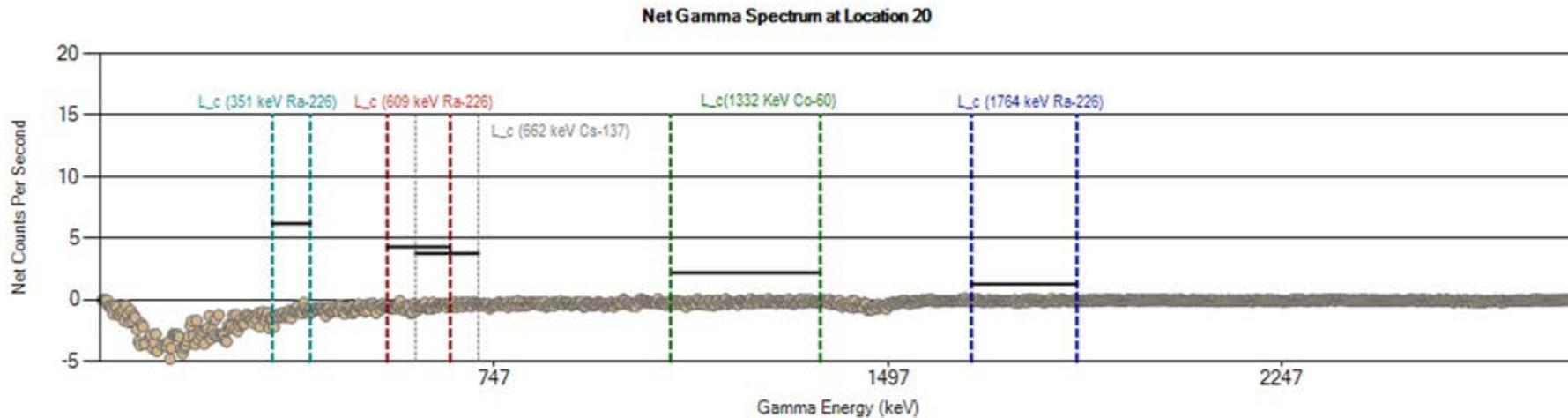
Net Gamma Spectrum at Location 19



Gamma Spectra at Location 19

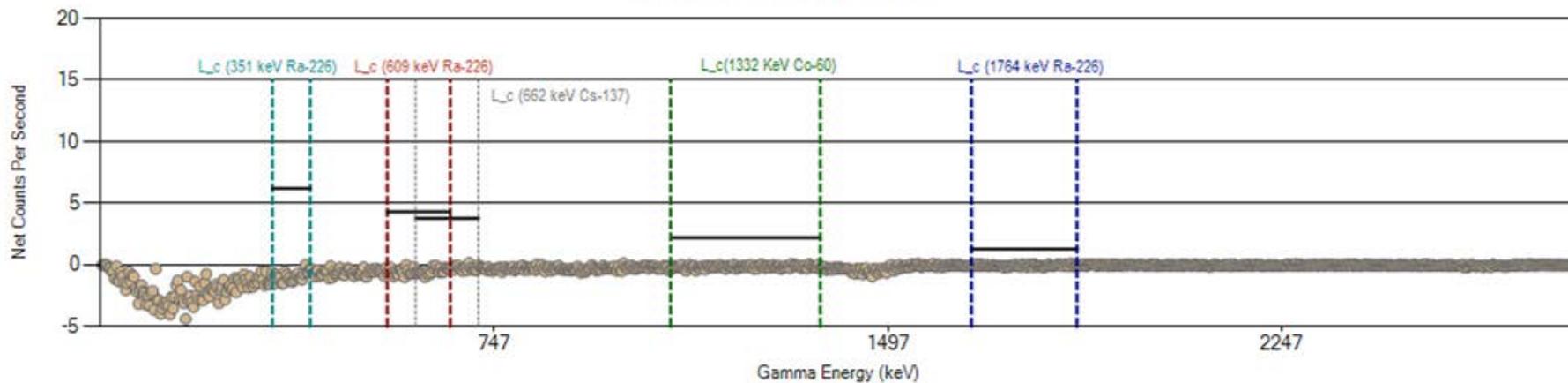


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	713	94	17	21	127	117	90	152	74	3215
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

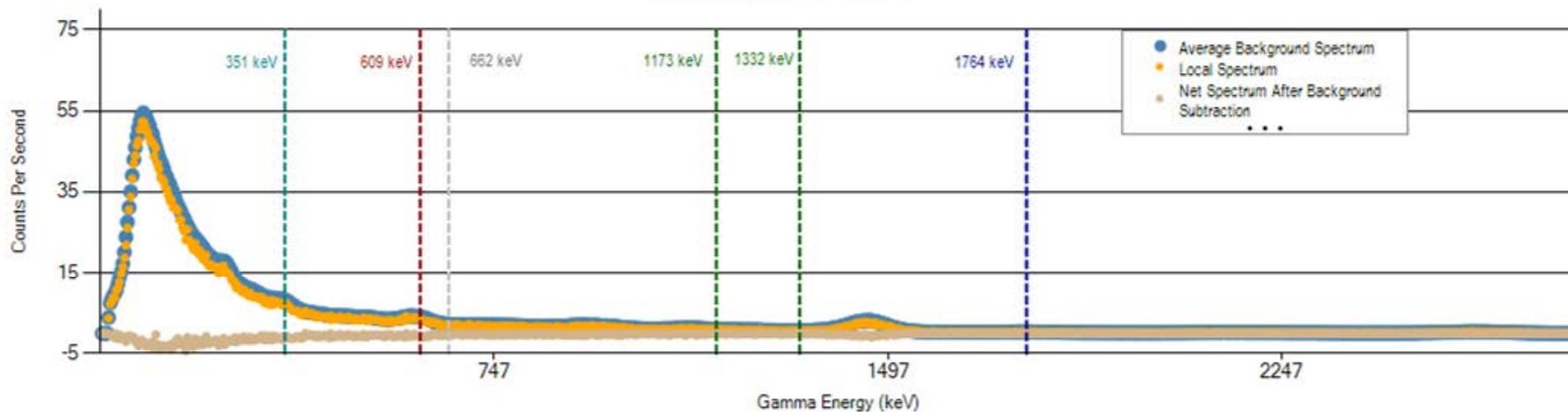


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	704	94	16	18	126	118	90	148	72	3182
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 21

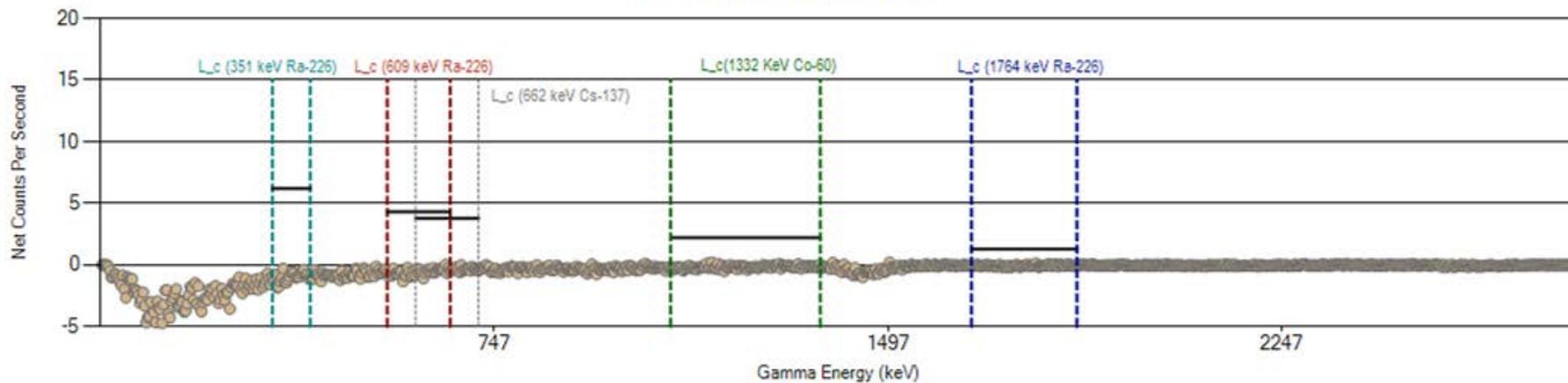


Gamma Spectra at Location 21

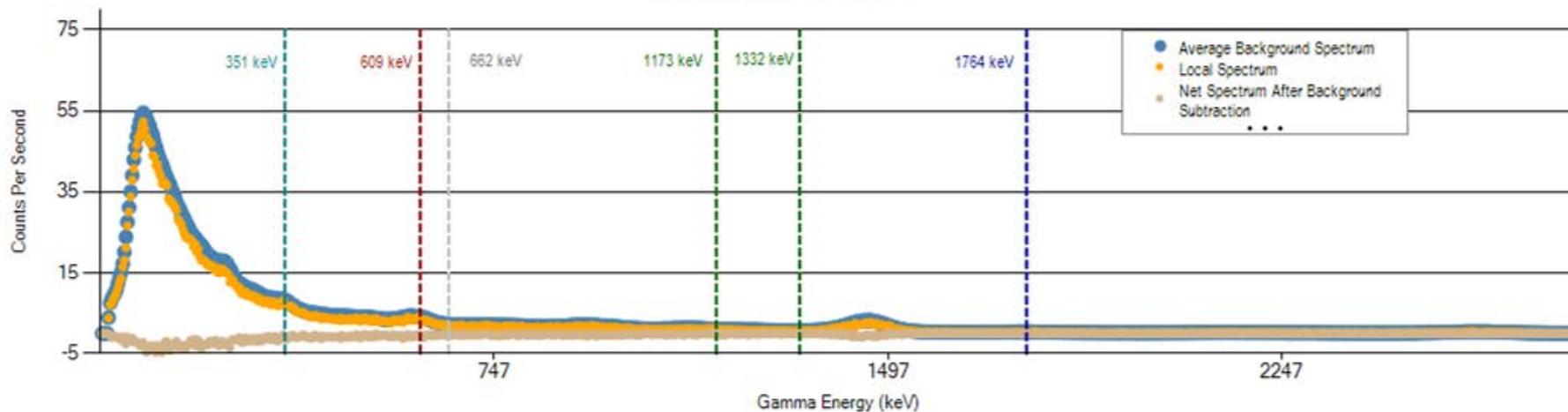


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	721	94	17	19	129	119	92	151	74	3251
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 22

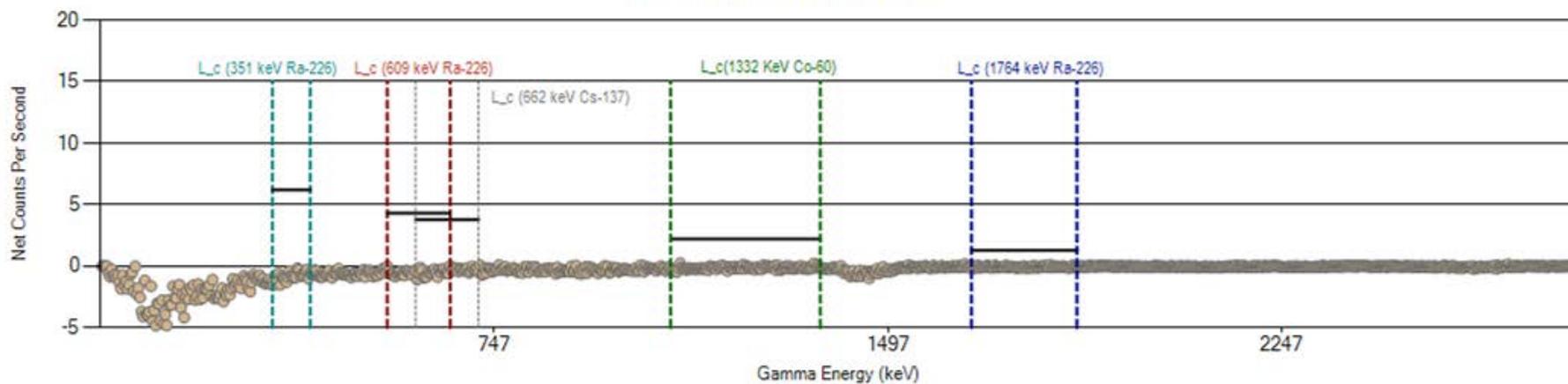


Gamma Spectra at Location 22

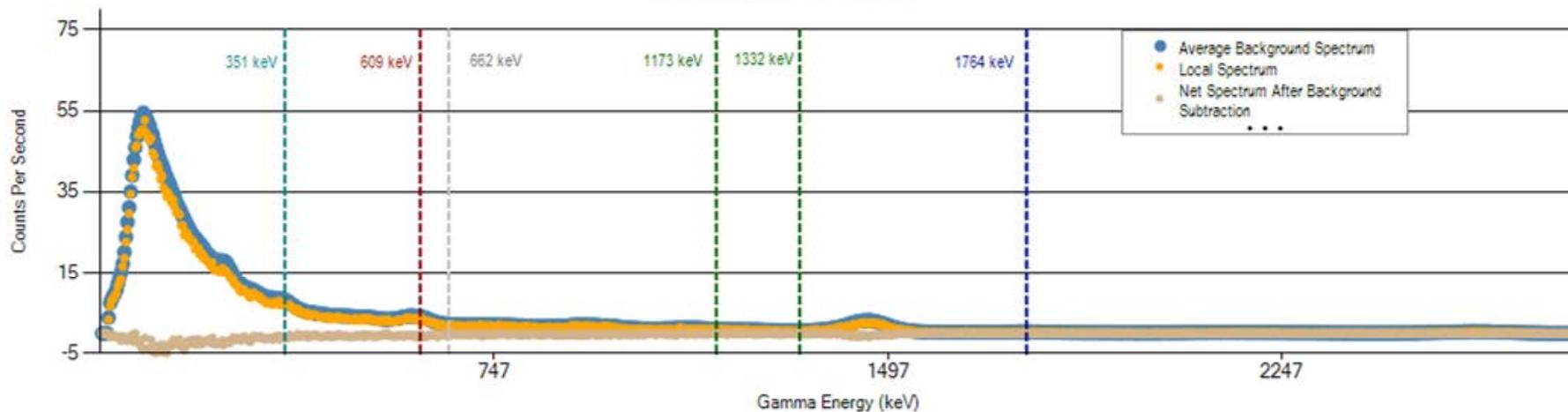


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	703	93	17	20	126	117	91	150	73	3194
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 23

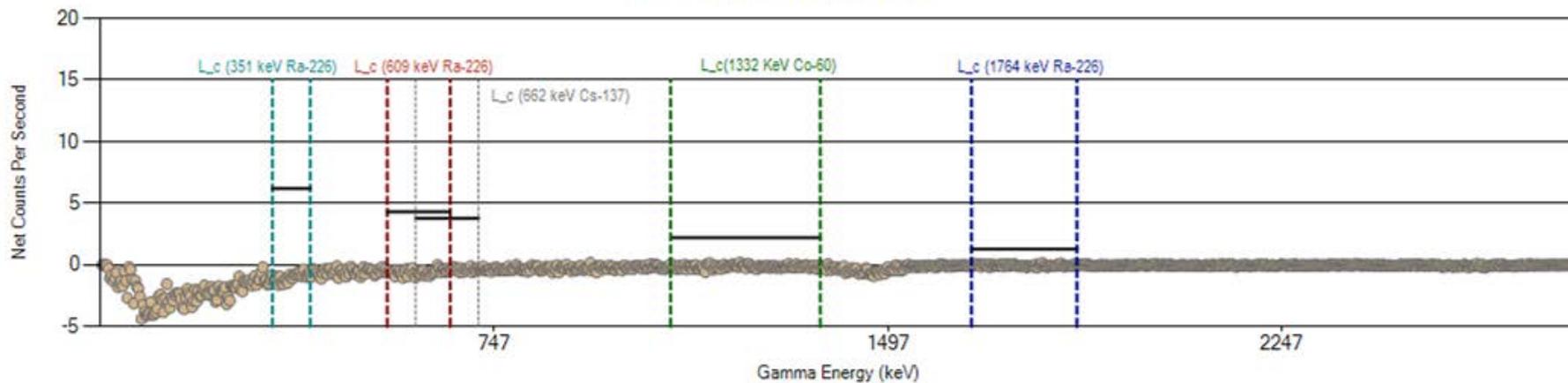


Gamma Spectra at Location 23

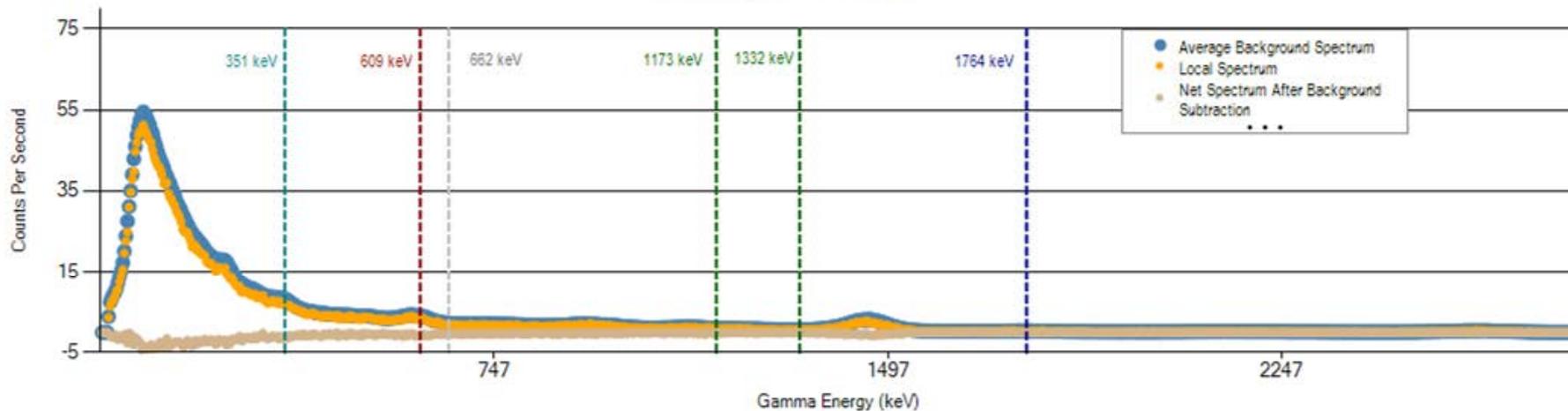


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	718	94	16	20	129	119	91	154	75	3243
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 24

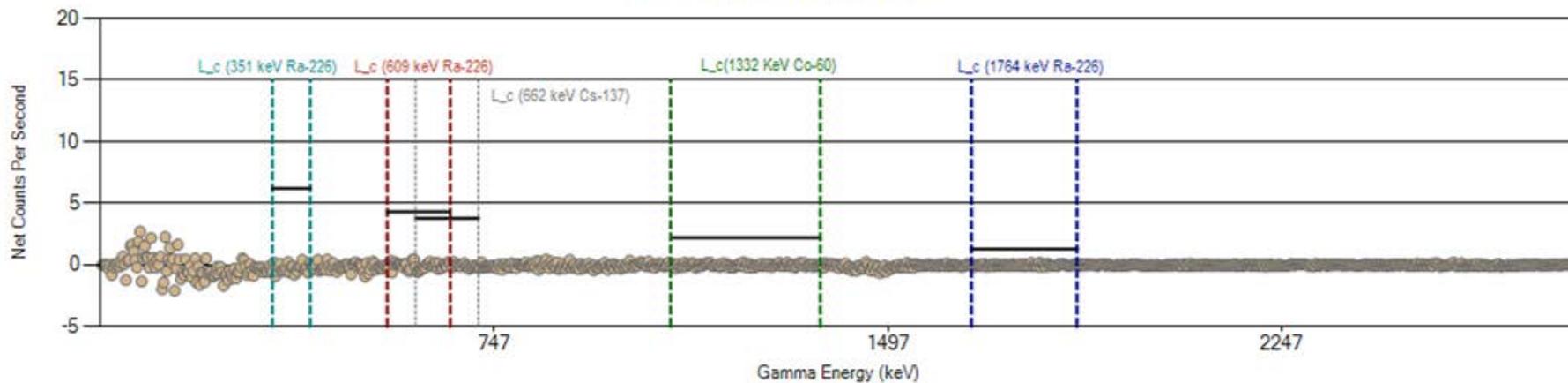


Gamma Spectra at Location 24

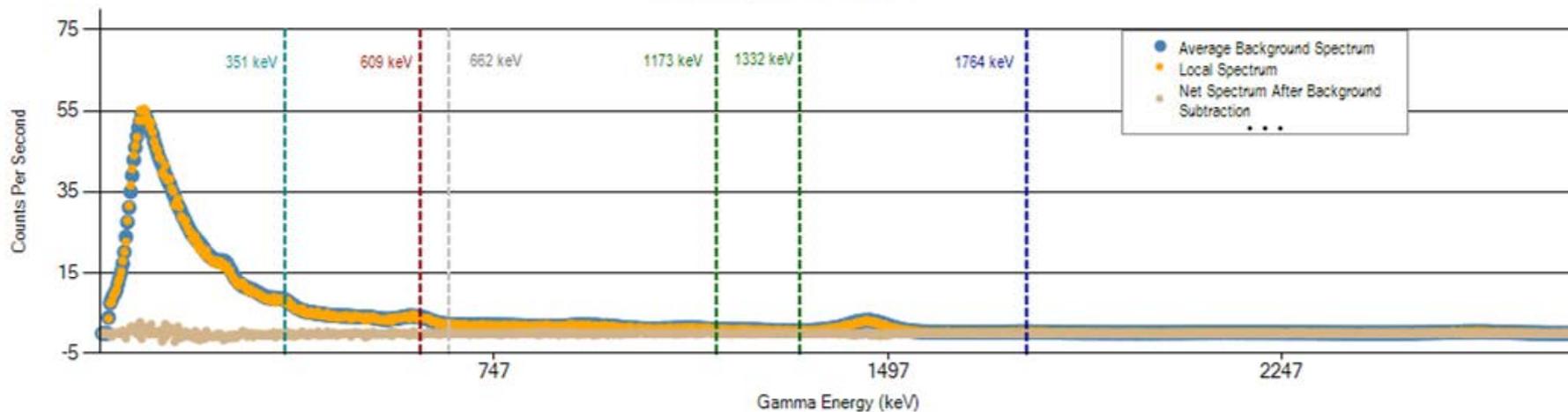


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 24 (cps)	719	92	18	19	130	117	89	149	75	3229
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 25

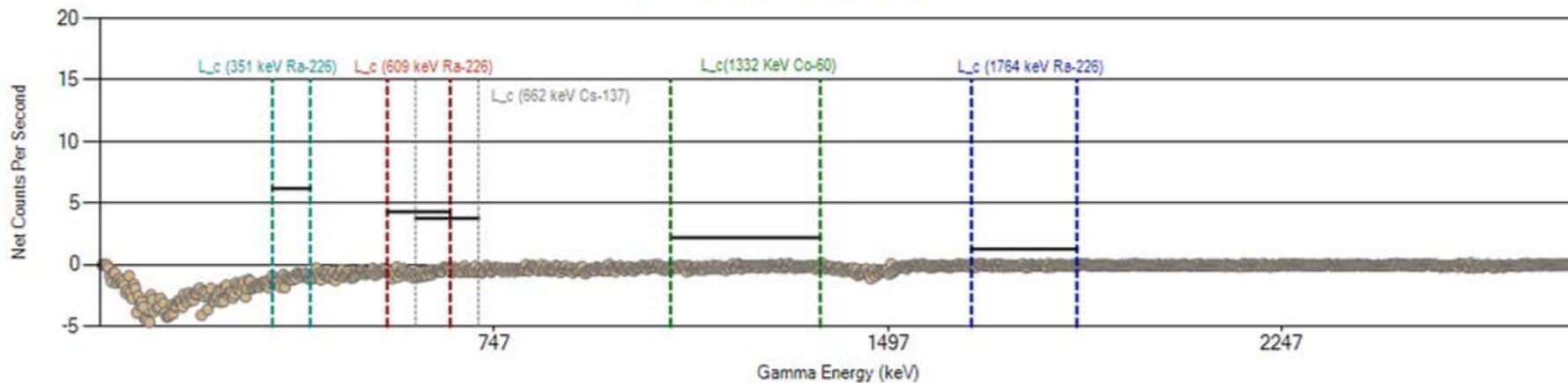


Gamma Spectra at Location 25

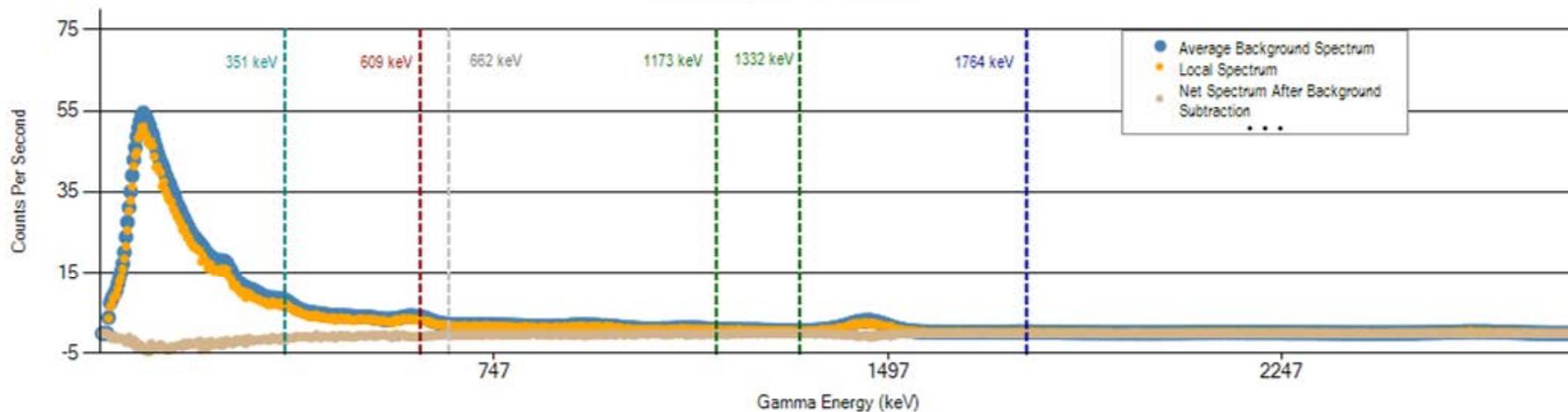


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 25 (cps)	820	106	19	22	147	137	104	168	87	3553
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 26

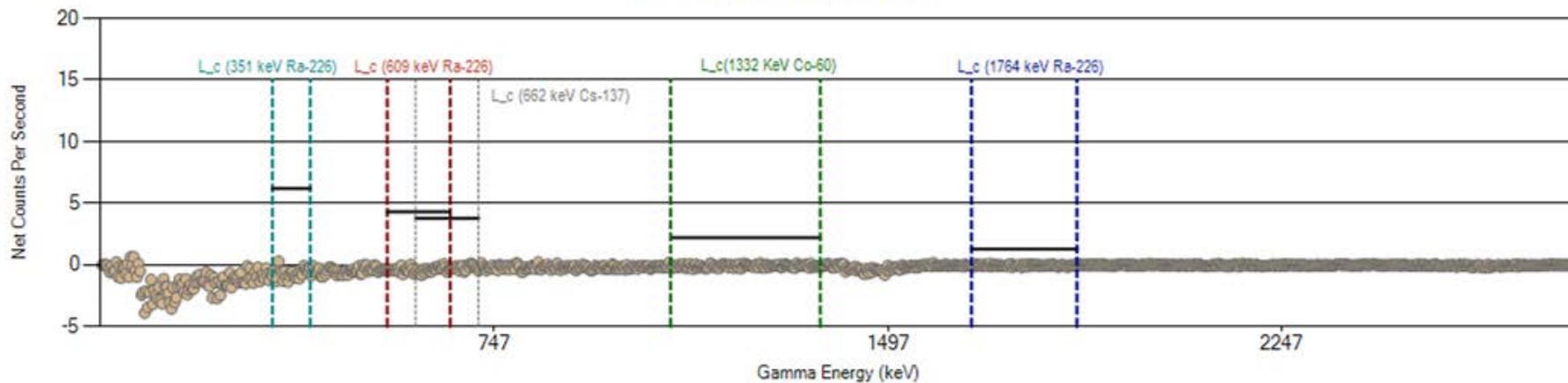


Gamma Spectra at Location 26

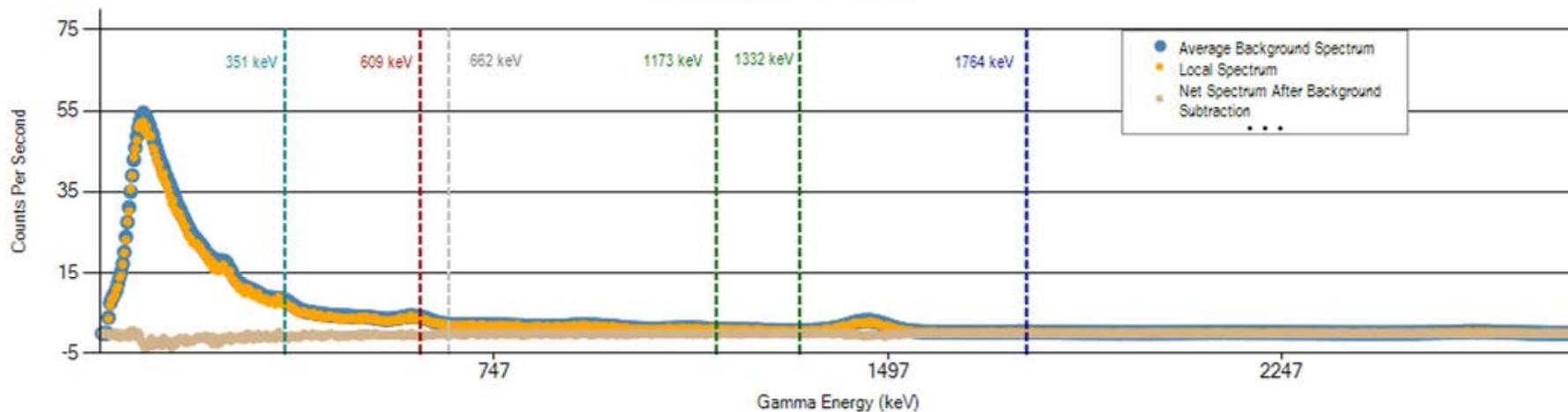


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 26 (cps)	699	92	17	19	126	115	87	147	73	3172
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 27

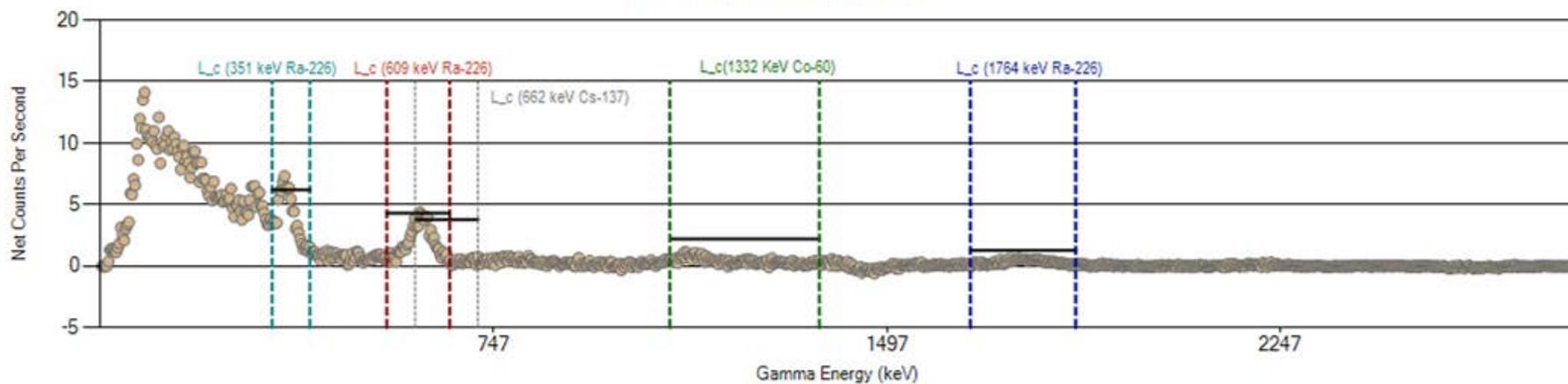


Gamma Spectra at Location 27

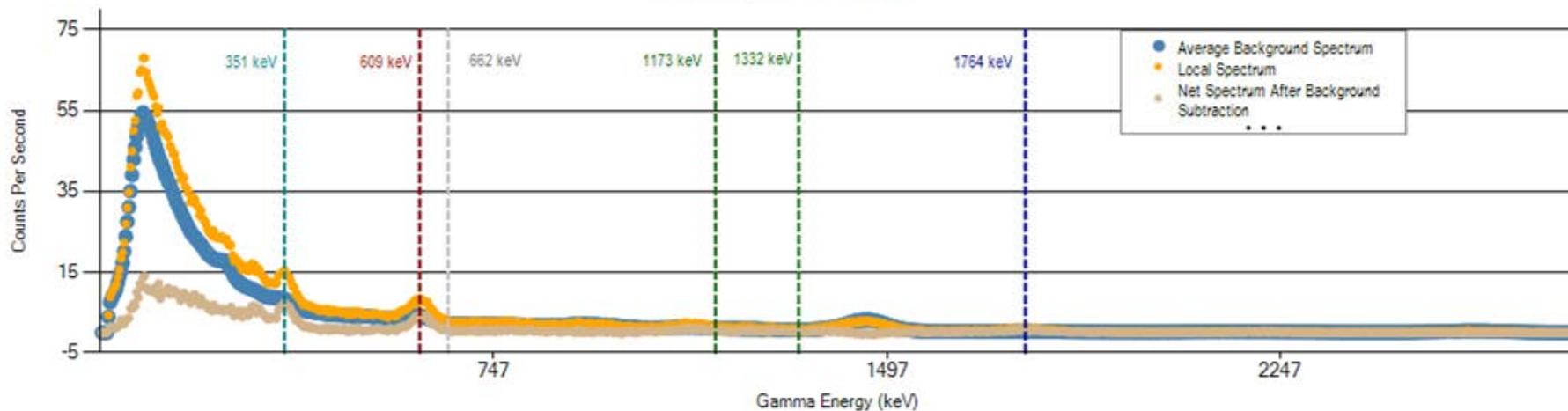


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 27 (cps)	755	99	18	19	135	124	95	157	80	3352
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

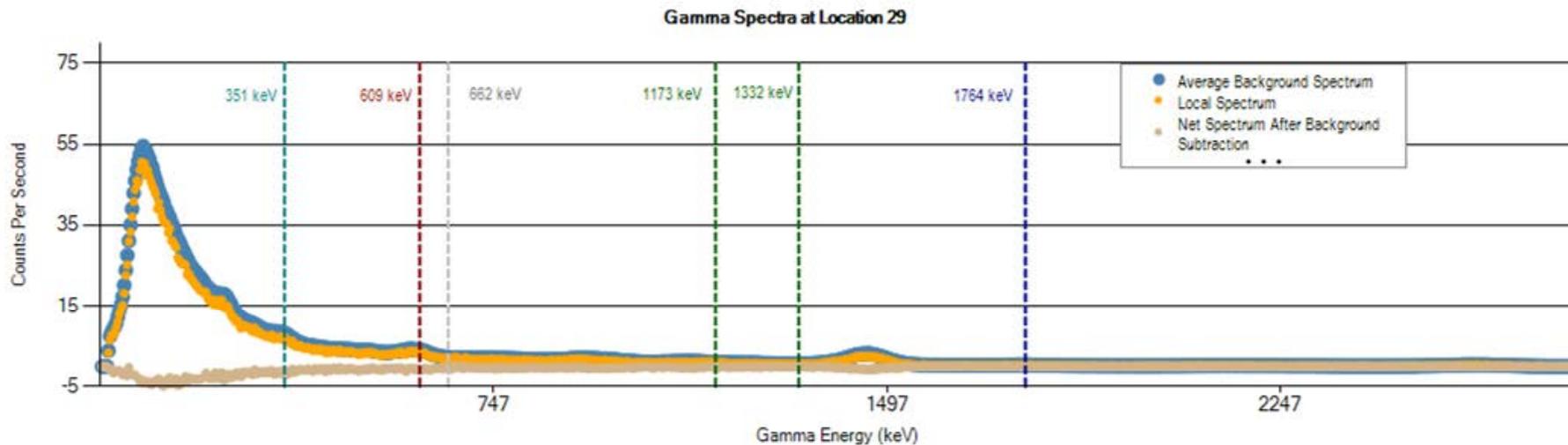
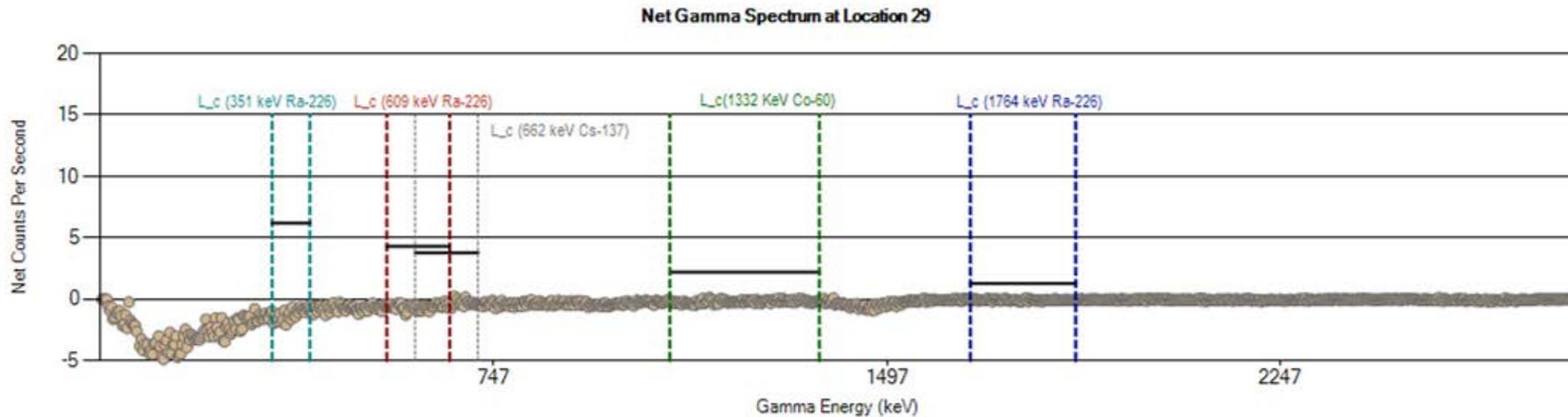
Net Gamma Spectrum at Location 28



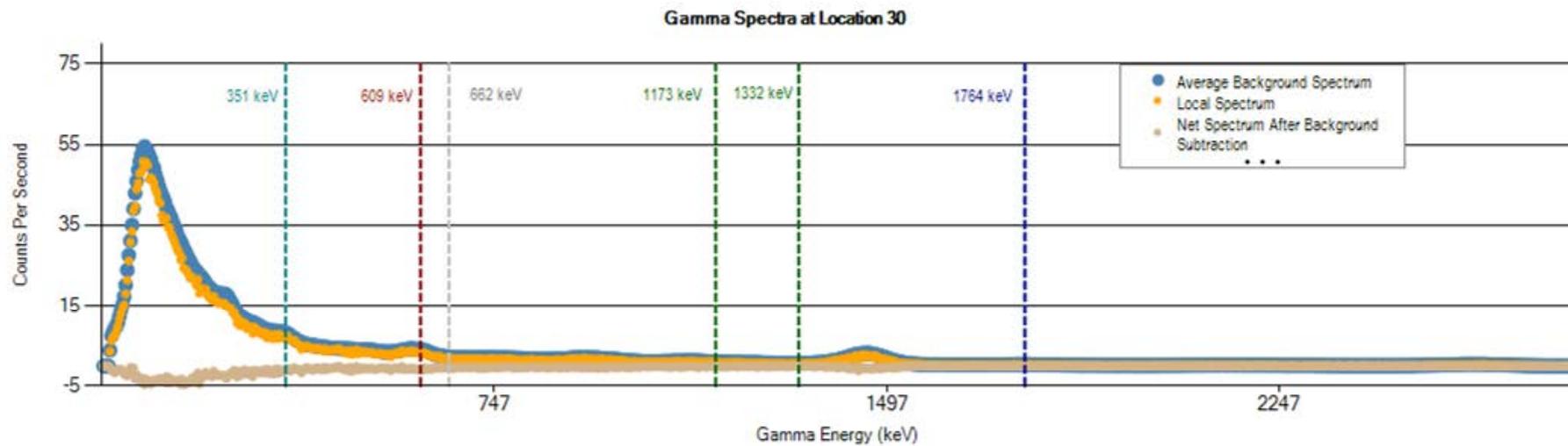
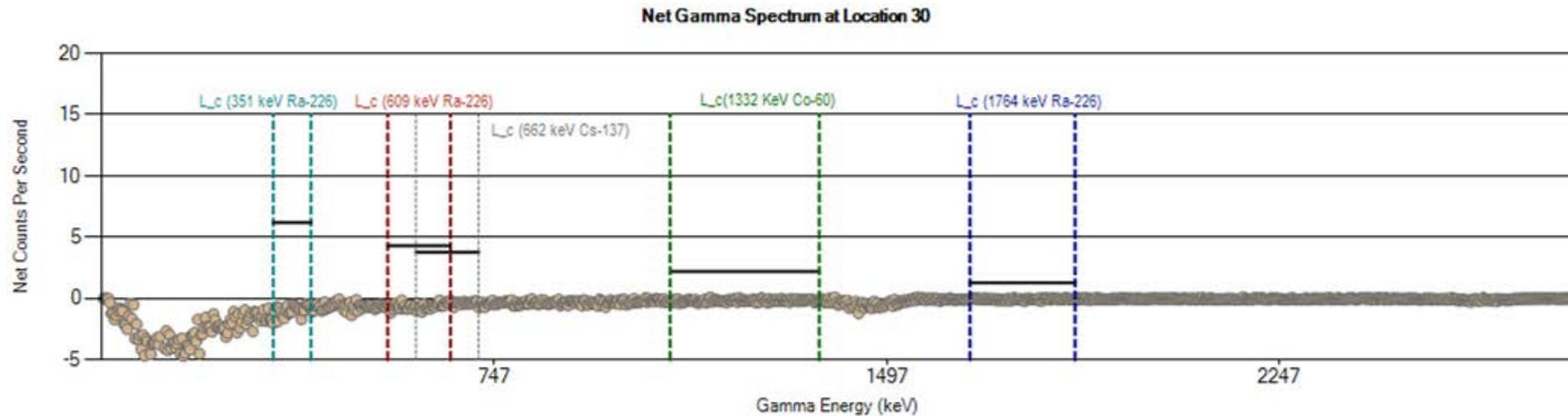
Gamma Spectra at Location 28



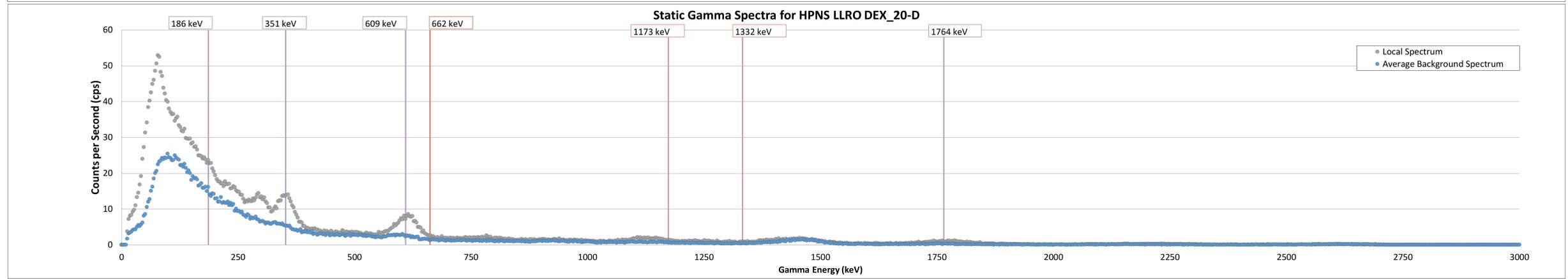
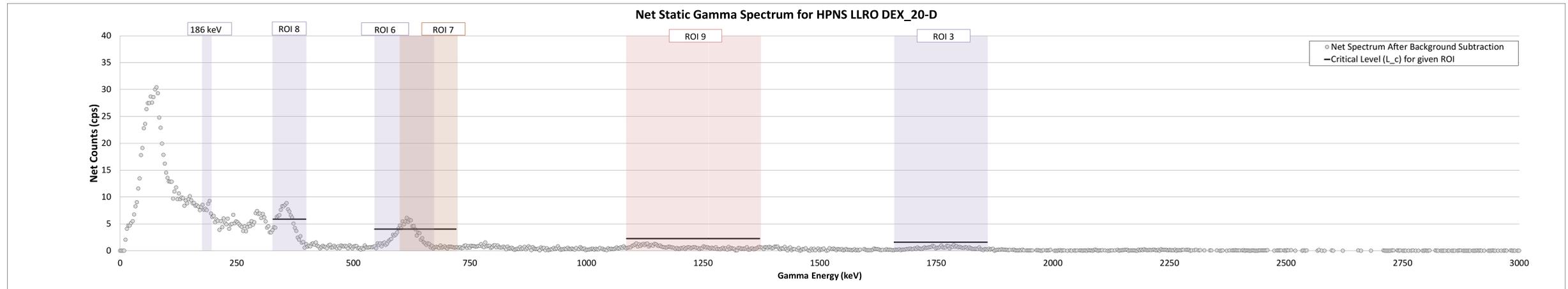
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 28 (cps)	<b>1073</b>	115	<b>42</b>	21	179	<b>219</b>	<b>165</b>	<b>272</b>	<b>127</b>	<b>4630</b>
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 29 (cps)	695	91	16	19	126	115	89	144	71	3146
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 30 (cps)	703	92	17	18	125	115	88	150	73	3172
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



Region of Interest (ROI)	ROI 1: Total Counts 411 - 2811 keV	ROI 2: K-40 (K-40 @ 1460.75 keV) 1371 - 1569 keV	ROI 3: Ra-226 (Bi-214 @ 1764.51 keV) 1659 - 1860 keV	ROI 4: Th-232 (Tl-208 @ 2614.00 keV) 2409 - 2811 keV	ROI 5: Annihilation (e <sup>-</sup> + e <sup>+</sup> @ 511.00 keV) 456 - 570 keV	ROI 6: Ra-226 (Bi-214 @ 609.32 keV) 546 - 666 keV	ROI 7: Cs-137 (Ba-137m @ 661.62 keV) 600 - 720 keV	ROI 8: Ra-226 (Pb-214 @ 351.99 keV) 327 - 399 keV	ROI 9: Co-60 (Ni-60m @ 1173.23/1332.51 keV) 1086 - 1371 keV	ROI 10: Gross Counts 24 - 2811 keV
Sum of Local Counts in ROI	877	79	48	11	131	207	164	248	116	3,579
$\mu + 3\sigma$ Investigation Level (Based on Sum of Bkgd. Counts in ROI)	602	82	28	24	133	121	95	154	80	2,197

Radium-226 Analysis Summary		Cesium-137 Analysis Summary		Co-60 Analysis Summary	
Are there critical level exceedances in Ra-226 ROIs?	Yes	Are there any critical level exceedances in Cs-137 ROIs?	Yes	Are there any critical level exceedances in Co-60 ROIs?	No
For which Ra-226 ROIs do critical level exceedances occur?	ROI 8, ROI 6,	For which Cs-137 ROIs do critical level exceedances occur?	ROI 7	For which Co-60 ROIs do critical level exceedances occur?	N/A
Does the sum of the counts in any Ra-226 ROIs exceed the $\mu + 3\sigma$ IL?	Yes	Does the sum of the counts in any Cs-137 ROIs exceed the $\mu + 3\sigma$ IL?	Yes	Does the sum of the counts in any Co-60 ROIs exceed the $\mu + 3\sigma$ IL?	Yes
For which Ra-226 ROIs do $\mu + 3\sigma$ IL exceedances occur?	ROI 3, ROI 6, ROI 8	For which Cs-137 ROIs do $\mu + 3\sigma$ IL exceedances occur?	ROI 7	For which Co-60 ROIs do $\mu + 3\sigma$ IL exceedances occur?	ROI 9
What is the Ra-226 to Th-232 activity ratio?	2.6	Are there visibly identifiable peaks in the spectra for Cs-137?	N/A	Are there two visibly identifiable peaks in the spectra for Co-60?	N/A
Is this ratio outside of the background ratio range (0.5 to 2.5)?	Yes	Are net peaks aligned with known emission energies?	N/A	Are both net peaks aligned with known emission energies?	N/A
Is there a visibly identifiable net peak at 186 keV?	Yes	Is the activity in Cs-137 ROIs inconsistent with activity at adjacent energies?	N/A	Is the activity in Co-60 ROIs inconsistent with activity at adjacent energies?	N/A
<b>Conclusion: Ra-226.</b>		<b>Conclusion: Cs-137 activity consistent with background.</b>		<b>Conclusion: Co-60 activity consistent with background.</b>	
		Elevated activity in Cs-137 ROI due to the presence of Ra-226 daughter (Bi-214) at ~665 keV.		Elevated activity in Co-60 ROI due to the presence of Ra-226 daughters (Bi-214) at ~1120 and 1238 keV.	
		<small>*Critical and investigation levels are based on background activity, and exceedances do not necessarily indicate the presence of Cs-137 above background. Cs-137 exists at very low concentrations in the background, resulting in low critical and investigation levels that are easily exceeded due to Compton scattering of higher energy photons. Confirmation of net Cs-137 requires visible identification of a significant peak at 662 keV (in addition to critical level and investigation level exceedances in ROI 7).</small>		<small>*Critical and investigation levels are based on background activity, and exceedances do not necessarily indicate the presence of Co-60 above background. Co-60 does not exist naturally in the background, resulting in low critical and investigation levels that are easily exceeded due to Compton scattering of higher energy photons. Confirmation of net Co-60 requires visible identification of significant peaks at 1173 keV and 1332 keV (in addition to critical level and investigation level exceedances in ROI 9).</small>	

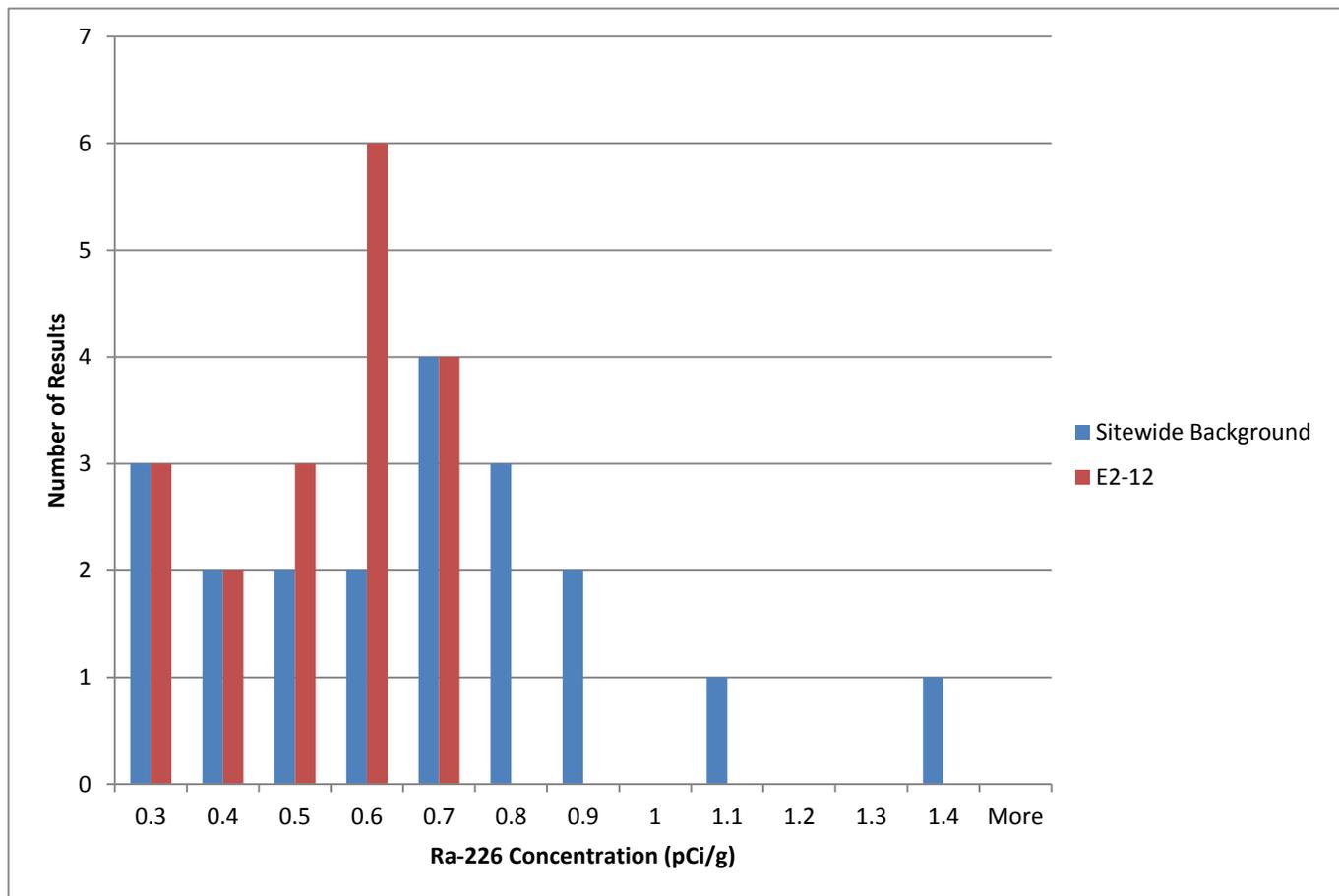
NORM Analysis Summary	
Are there any critical level exceedances in Th-232 or K-40 (NORM) ROIs?	Yes
For which isotopes do critical level exceedances occur?	Th-232
Does the sum of the counts in any NORM ROIs exceed the $\mu + 3\sigma$ IL?	Yes
For which isotopes do $\mu + 3\sigma$ IL exceedances occur?	N/A
Is there a visible K-40 line at 1460 keV in the net static spectrum?	No
Which isotopes are responsible for activity in excess of ref. area values?	Th-232
<b>Conclusion: Elevated activity at NORM energies due to Ra-226 daughters.</b>	
Notes:	

Filename: DEX\_20180919\_220657.csv  
 Date of Measurement: 06/57/9\_22  
 Background Dataset: (RSI2/SN 7236) HPNS Bldg 258 (07/16/2018)  
 Background Dataset Filename: RSI\_Survey\_20180716\_150929-Background.csv  
 Energy Calibration (keV): 3.00\*(channel)

Histogram, RSY E2 (Use 12) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

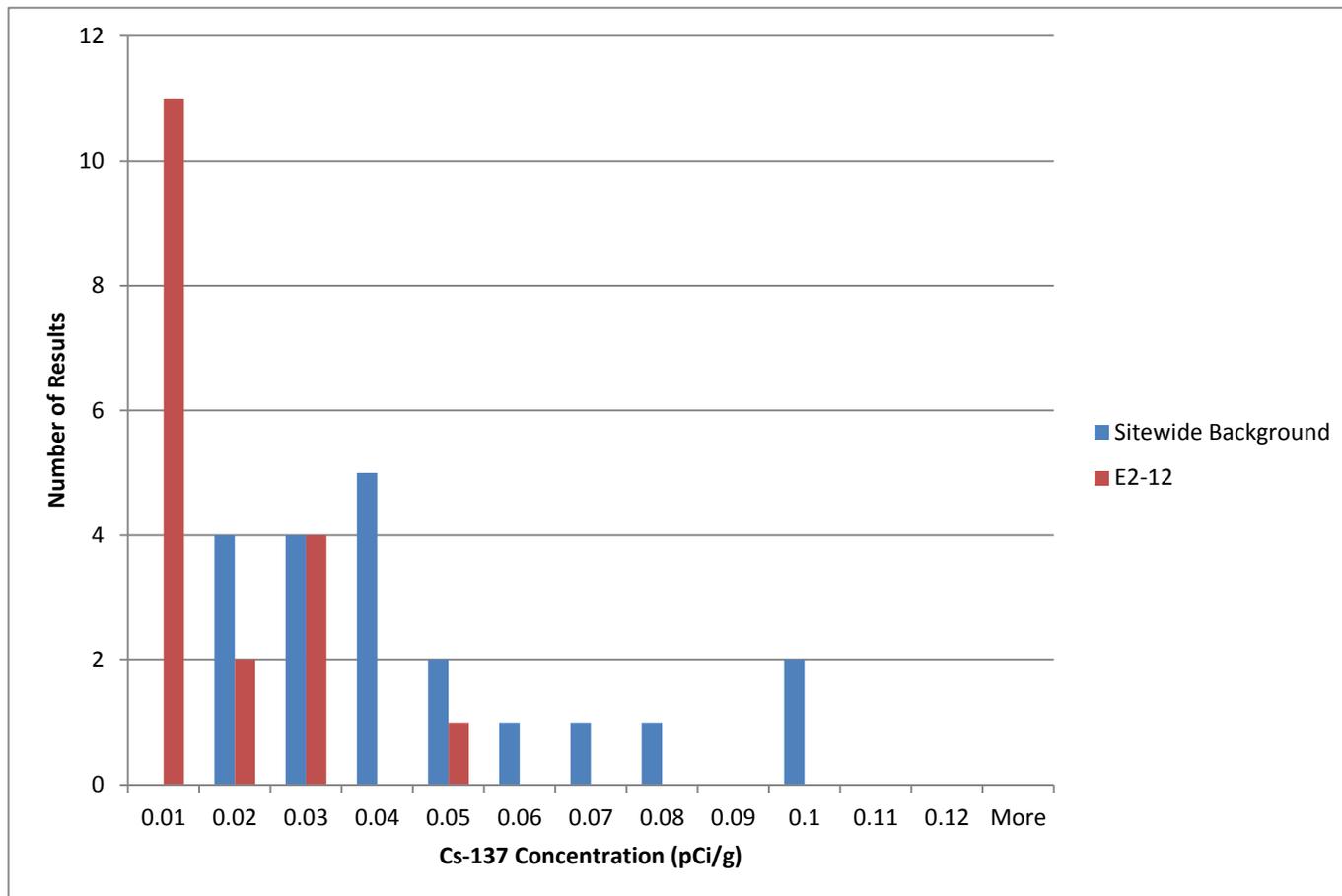
E2-12	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	3
0.6	6
0.7	4
0.8	0
0.9	0
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



Histogram, RSY E2 (Use 12) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

E2-12	
<i>Bin</i>	<i>Frequency</i>
0.01	11
0.02	2
0.03	4
0.04	0
0.05	1
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-29899-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

Authorized for release by:  
8/29/2018 4:48:29 PM

Rhonda Ridenhower, Manager of Project Management  
(314)298-8566  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)



### LINKS

Review your project results through  
**TotalAccess**

Have a Question?

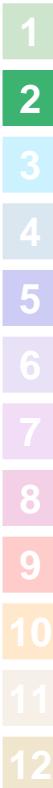


Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

**Job ID: 160-29899-2**

**Laboratory: TestAmerica St. Louis**

### Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: Hunters Point Naval Shipyard - Parcel E2**

**Report Number: 160-29899-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

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### Job ID: 160-29899-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 08/01/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.5 C.

#### TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYE2-U12-S001 (160-29899-1) and PE2-RSYE2-U12-S011 (160-29899-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 08/01/2018, prepared on 08/07/2018 and analyzed on 08/23/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYE2-U12-S001 (160-29899-1) and PE2-RSYE2-U12-S011 (160-29899-11). The samples contained detritus material and rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYE2-U12-S001 (160-29899-1), PE2-RSYE2-U12-S002 (160-29899-2), PE2-RSYE2-U12-S003 (160-29899-3), PE2-RSYE2-U12-S004 (160-29899-4), PE2-RSYE2-U12-S005 (160-29899-5), PE2-RSYE2-U12-S006 (160-29899-6), PE2-RSYE2-U12-S007 (160-29899-7), PE2-RSYE2-U12-S008 (160-29899-8), PE2-RSYE2-U12-S009 (160-29899-9), PE2-RSYE2-U12-S010 (160-29899-10), PE2-RSYE2-U12-S011 (160-29899-11), PE2-RSYE2-U12-S012 (160-29899-12), PE2-RSYE2-U12-S013 (160-29899-13), PE2-RSYE2-U12-S014 (160-29899-14), PE2-RSYE2-U12-S015 (160-29899-15), PE2-RSYE2-U12-S016 (160-29899-16), PE2-RSYE2-U12-S017 (160-29899-17) and PE2-RSYE2-U12-S018 (160-29899-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 08/01/2018, prepared on 08/03/2018 and analyzed on 08/24/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. PE2-RSYE2-U12-S001 (160-29899-1), PE2-RSYE2-U12-S003 (160-29899-3), PE2-RSYE2-U12-S006 (160-29899-6), PE2-RSYE2-U12-S007 (160-29899-7) and PE2-RSYE2-U12-S008 (160-29899-8)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

# CHAIN OF CUSTODY

Project Number: 500506

CTO-013 RSYE2 USE 12 North Perimeter  
Trench Construction Spoils Systematic

Project Name: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.31.18

Waybill Number: 17665451376333603

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North  
Earth City, MO 63045

Lab Contact Name / ph #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): *Joselyn Ramirez*

Sample ID Number	Sample Description	Collection Information		Matrix	# Containers	Preservative (water)		Dose Rate µR/Hr
		Date	Time			Preservative (soil)	Container Type	
PE2-RSYE2-U12-S001	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0905	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S002	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0916	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S003	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0915	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S004	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0920	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S005	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0925	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S006	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0929	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S007	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0933	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S008	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0938	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S009	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0943	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S010	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0948	SO	1	16 oz. plastic jar	X	5

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.  
7 days ingrown draft and follow with 21 days final.

Level Of QC Required:  24-hr  3-day  10-day  III

Standard TAT - 10-day  3-day  10-day  III

Relinquished By: *Joselyn Ramirez* Date: 7.31.18 Time: 1000  
 Relinquished By: *Eddie Kalombo* Date: 7.31.18 Time: 1600  
 Relinquished By: *Michael Heim* Date: 8.1.18 Time: 0905  
 Relinquished By: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Method Codes: C = Composite G = Grab  
 Matrix Codes: SO = Soil  
 DW = Drinking Water SL = Sludge  
 WW = Waste Water CP = Chip Samples  
 A = Air ABS=Asbestos, PO=Pipe Opening



160-29899 Chain of Custody





APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

# CHAIN OF CUSTODY

Project Number: 500506

CTO-013 RSYE2 USE 12 North Perimeter  
Trench Construction Spoils Systematic

Project Name:

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.31.18

Waybill Number: 126V5451316333603

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): J. Johnson

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Preservative (water)		Dose Rate $\mu$ R/hr
		Date	Time	Method			Preservative (soil)	Container Type	
PE2-RSYE2-U12-S011	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0953	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S012	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	0958	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S013	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1006	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S014	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1011	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S015	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1016	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S016	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1021	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S017	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1026	G	SO	1	16 oz. plastic jar	X	5
PE2-RSYE2-U12-S018	Parcel E-2 RSYE2 USE 12 Systematic	7/26/18	1031	G	SO	1	16 oz. plastic jar	X	5

### Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.  
7 days ingrowth draft and follow with 21 days final.

Level Of QC Required:  24-hr  3-day  10-day  III

Standard TAT - 10-day

Relinquished By: JOAQUIN LAMAREZ Date: 7.31.18 Time: 1600  
Relinquished By: EDDIE KALOMBO Date: 7.31.18 Time: 1600

Received By: EDDIE KALOMBO Date: 7.31.18 Time: 1600  
Received By: Michael Helma Date: 8.1.18 Time: 0905

Method Codes: C = Composite G = Grab  
Matrix Codes: DW = Drinking Water SO = Soil  
GW = Ground Water SL = Sludge  
WW = Waste Water CP = Chip Samples  
A = Air ABS=Asbestos, PO=Pipe Opening



## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29899-2

**Login Number: 29899****List Source: TestAmerica St. Louis****List Number: 1****Creator: McKinney, Gerrod E**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	20.5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

## Definitions/Glossary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

### Qualifiers

#### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

## Method Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

**Protocol References:**

DOE = U.S. Department of Energy

None = None

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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# Sample Summary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29899-1	PE2-RSYE2-U12-S001	Solid	07/26/18 09:05	08/01/18 09:05
160-29899-2	PE2-RSYE2-U12-S002	Solid	07/26/18 09:10	08/01/18 09:05
160-29899-3	PE2-RSYE2-U12-S003	Solid	07/26/18 09:15	08/01/18 09:05
160-29899-4	PE2-RSYE2-U12-S004	Solid	07/26/18 09:20	08/01/18 09:05
160-29899-5	PE2-RSYE2-U12-S005	Solid	07/26/18 09:25	08/01/18 09:05
160-29899-6	PE2-RSYE2-U12-S006	Solid	07/26/18 09:29	08/01/18 09:05
160-29899-7	PE2-RSYE2-U12-S007	Solid	07/26/18 09:33	08/01/18 09:05
160-29899-8	PE2-RSYE2-U12-S008	Solid	07/26/18 09:38	08/01/18 09:05
160-29899-9	PE2-RSYE2-U12-S009	Solid	07/26/18 09:43	08/01/18 09:05
160-29899-10	PE2-RSYE2-U12-S010	Solid	07/26/18 09:48	08/01/18 09:05
160-29899-11	PE2-RSYE2-U12-S011	Solid	07/26/18 09:53	08/01/18 09:05
160-29899-12	PE2-RSYE2-U12-S012	Solid	07/26/18 09:58	08/01/18 09:05
160-29899-13	PE2-RSYE2-U12-S013	Solid	07/26/18 10:06	08/01/18 09:05
160-29899-14	PE2-RSYE2-U12-S014	Solid	07/26/18 10:11	08/01/18 09:05
160-29899-15	PE2-RSYE2-U12-S015	Solid	07/26/18 10:16	08/01/18 09:05
160-29899-16	PE2-RSYE2-U12-S016	Solid	07/26/18 10:21	08/01/18 09:05
160-29899-17	PE2-RSYE2-U12-S017	Solid	07/26/18 10:26	08/01/18 09:05
160-29899-18	PE2-RSYE2-U12-S018	Solid	07/26/18 10:31	08/01/18 09:05

## Client Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S001

Lab Sample ID: 160-29899-1

Date Collected: 07/26/18 09:05

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0241	U	0.0617	0.0617	0.331	0.0485	pCi/g	08/07/18 18:44	08/23/18 05:57	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	83.0		40 - 110					08/07/18 18:44	08/23/18 05:57	1

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.758</b>		0.270	0.281		0.0895	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Actinium-227	0.0298	U	0.0568	0.0569		0.768	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Bismuth-212	-0.0471	U	1.13	1.13		0.760	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Bismuth-214</b>	<b>0.746</b>		0.184	0.200		0.0572	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Cesium-137	-0.0605	U	0.100	0.100	0.0700	0.0744	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Cobalt-60	-0.0563	U	0.0944	0.0946	0.200	0.0761	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Lead-210	-0.138	U	2.06	2.06		1.70	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Lead-212</b>	<b>0.697</b>		0.126	0.155		0.0576	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Lead-214</b>	<b>0.643</b>		0.161	0.174		0.0710	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Potassium-40</b>	<b>9.26</b>		1.67	1.92		0.324	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Protactinium-231	-0.136	U	3.39	3.39		2.79	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Radium-226</b>	<b>0.746</b>		0.184	0.200	0.700	0.0572	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Radium-228</b>	<b>0.758</b>		0.270	0.281		0.0895	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thallium-208</b>	<b>0.273</b>		0.0781	0.0831		0.0241	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thorium-228</b>	<b>0.697</b>		0.126	0.155		0.0576	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thorium-232</b>	<b>0.758</b>		0.270	0.281		0.0895	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Thorium-234	-0.194	U	1.95	1.95		1.61	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Uranium-235	-0.257	U	0.222	0.224		0.582	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Uranium-238	-0.194	U	1.95	1.95		1.61	pCi/g	08/03/18 12:11	08/24/18 08:00	1

Client Sample ID: PE2-RSYE2-U12-S002

Lab Sample ID: 160-29899-2

Date Collected: 07/26/18 09:10

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.749</b>		0.214	0.227		0.0801	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Actinium-227	0.386	U	1.05	1.06		0.853	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Bismuth-212	-0.0168	U	0.710	0.710		0.859	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Bismuth-214	0.0896	U	0.225	0.225		0.218	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Cesium-137	0.0324	U	0.0707	0.0708	0.0700	0.0548	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Cobalt-60	0.0322	U	0.0613	0.0614	0.200	0.0368	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Lead-210</b>	<b>1.55</b>		2.22	2.23		1.35	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Lead-212</b>	<b>0.701</b>		0.128	0.148		0.0585	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Lead-214</b>	<b>0.736</b>		0.164	0.180		0.0772	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Potassium-40</b>	<b>9.53</b>		1.67	1.93		0.434	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Protactinium-231	0.835	U	2.69	2.69		2.94	pCi/g	08/03/18 12:11	08/24/18 08:00	1

## Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S002

Lab Sample ID: 160-29899-2

Date Collected: 07/26/18 09:10

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.0896	U	0.225	0.225	0.700	0.218	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Radium-228</b>	<b>0.749</b>		0.214	0.227		0.0801	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thallium-208</b>	<b>0.300</b>		0.0811	0.0867		0.0269	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thorium-228</b>	<b>0.701</b>		0.128	0.148		0.0585	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thorium-232</b>	<b>0.749</b>		0.214	0.227		0.0801	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Thorium-234</b>	<b>1.03</b>		1.21	1.21		0.925	pCi/g	08/03/18 12:11	08/24/18 08:00	1
Uranium-235	0.297	U	0.213	0.215		0.729	pCi/g	08/03/18 12:11	08/24/18 08:00	1
<b>Uranium-238</b>	<b>1.03</b>		1.21	1.21		0.925	pCi/g	08/03/18 12:11	08/24/18 08:00	1

Client Sample ID: PE2-RSYE2-U12-S003

Lab Sample ID: 160-29899-3

Date Collected: 07/26/18 09:15

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.543</b>		0.217	0.224		0.115	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Actinium-227	0.386	U	0.796	0.797		0.636	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Bismuth-212	0.00674	U	0.905	0.905		0.744	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Bismuth-214</b>	<b>0.543</b>		0.161	0.171		0.0586	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Cesium-137	0.000805	U	0.0910	0.0910	0.0700	0.0746	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Cobalt-60	0.0248	U	0.0418	0.0419	0.200	0.0269	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Lead-210	0.219	U	1.59	1.59		1.30	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Lead-212</b>	<b>0.720</b>		0.116	0.149		0.0442	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Lead-214</b>	<b>0.509</b>		0.123	0.134		0.0546	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Potassium-40</b>	<b>7.51</b>		1.45	1.64		0.300	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Protactinium-231	0.418	U	1.59	1.59		2.50	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Radium-226</b>	<b>0.543</b>		0.161	0.171	0.700	0.0586	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Radium-228</b>	<b>0.543</b>		0.217	0.224		0.115	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Thallium-208</b>	<b>0.193</b>		0.0729	0.0756		0.0284	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Thorium-228</b>	<b>0.720</b>		0.116	0.149		0.0442	pCi/g	08/03/18 12:11	08/24/18 08:04	1
<b>Thorium-232</b>	<b>0.543</b>		0.217	0.224		0.115	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Thorium-234	0.137	U	0.195	0.196		1.23	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Uranium-235	-0.295	U	0.352	0.354		0.567	pCi/g	08/03/18 12:11	08/24/18 08:04	1
Uranium-238	0.137	U	0.195	0.196		1.23	pCi/g	08/03/18 12:11	08/24/18 08:04	1

Client Sample ID: PE2-RSYE2-U12-S004

Lab Sample ID: 160-29899-4

Date Collected: 07/26/18 09:20

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.472</b>		0.207	0.213		0.123	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Actinium-227	-0.247	U	0.683	0.684		0.438	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Bismuth-212	0.504	U	1.00	1.00		0.790	pCi/g	08/03/18 12:11	08/24/18 08:03	1

## Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S004

Lab Sample ID: 160-29899-4

Date Collected: 07/26/18 09:20

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Bismuth-214</b>	<b>0.648</b>		0.125	0.142		0.0140	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Cesium-137	0.0250	U	0.0537	0.0538	0.0700	0.0415	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Cobalt-60	0.0132	U	0.0902	0.0903	0.200	0.0444	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Lead-210	-0.00648	U	1.38	1.38		1.13	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Lead-212</b>	<b>0.467</b>		0.103	0.120		0.0599	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Lead-214</b>	<b>0.614</b>		0.110	0.127		0.0444	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Potassium-40</b>	<b>8.42</b>		1.41	1.66		0.229	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Protactinium-231	-0.806	U	2.94	2.94		2.40	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Radium-226</b>	<b>0.648</b>		0.125	0.142	0.700	0.0140	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Radium-228</b>	<b>0.472</b>		0.207	0.213		0.123	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Thallium-208</b>	<b>0.182</b>		0.0888	0.0908		0.0389	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Thorium-228</b>	<b>0.467</b>		0.103	0.120		0.0599	pCi/g	08/03/18 12:11	08/24/18 08:03	1
<b>Thorium-232</b>	<b>0.472</b>		0.207	0.213		0.123	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Thorium-234	0.322	U	1.15	1.15		0.929	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Uranium-235	0.108	U	0.409	0.409		0.400	pCi/g	08/03/18 12:11	08/24/18 08:03	1
Uranium-238	0.322	U	1.15	1.15		0.929	pCi/g	08/03/18 12:11	08/24/18 08:03	1

Client Sample ID: PE2-RSYE2-U12-S005

Lab Sample ID: 160-29899-5

Date Collected: 07/26/18 09:25

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.640</b>		0.216	0.225		0.0453	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Actinium-227	0.251	U	0.476	0.476		0.456	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Bismuth-212</b>	<b>1.48</b>		0.606	0.625		0.144	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Bismuth-214	0.0405	U	0.212	0.212		0.157	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Cesium-137	0.00151	U	0.0523	0.0523	0.0700	0.0425	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Cobalt-60	0.0383	U	0.0263	0.0266	0.200	0.0591	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Lead-210	0.843	U	1.40	1.41		0.919	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Lead-212</b>	<b>0.640</b>		0.120	0.146		0.0487	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Lead-214</b>	<b>0.569</b>		0.133	0.146		0.0622	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Potassium-40</b>	<b>8.57</b>		1.71	1.92		0.371	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Protactinium-231	0.910	U	2.15	2.16		2.37	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Radium-226	0.0405	U	0.212	0.212	0.700	0.157	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Radium-228</b>	<b>0.640</b>		0.216	0.225		0.0453	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Thallium-208</b>	<b>0.252</b>		0.0776	0.0819		0.0195	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Thorium-228</b>	<b>0.640</b>		0.120	0.146		0.0487	pCi/g	08/03/18 12:11	08/24/18 08:01	1
<b>Thorium-232</b>	<b>0.640</b>		0.216	0.225		0.0453	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Thorium-234	0.0250	U	1.38	1.38		0.972	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Uranium-235	-0.0120	U	0.420	0.420		0.351	pCi/g	08/03/18 12:11	08/24/18 08:01	1
Uranium-238	0.0250	U	1.38	1.38		0.972	pCi/g	08/03/18 12:11	08/24/18 08:01	1

## Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S006

Lab Sample ID: 160-29899-6

Date Collected: 07/26/18 09:29

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.972</b>		0.240	0.260		0.0889	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Actinium-227	-0.0435	U	0.0977	0.0978		0.870	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Bismuth-212	0.369	U	0.708	0.709		0.539	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Bismuth-214</b>	<b>0.620</b>		0.147	0.160		0.0332	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cesium-137	-0.0586	U	0.100	0.101	0.0700	0.0787	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cobalt-60	0.0253	U	0.0696	0.0696	0.200	0.0324	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Lead-210	1.14	U	1.68	1.69		1.18	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-212</b>	<b>0.682</b>		0.128	0.147		0.0647	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-214</b>	<b>0.715</b>		0.153	0.169		0.0706	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Potassium-40</b>	<b>9.18</b>		1.47	1.74		0.137	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Protactinium-231	0.736	U	2.38	2.38		2.61	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-226</b>	<b>0.620</b>		0.147	0.160	0.700	0.0332	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-228</b>	<b>0.972</b>		0.240	0.260		0.0889	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thallium-208</b>	<b>0.231</b>		0.0723	0.0760		0.0261	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-228</b>	<b>0.682</b>		0.128	0.147		0.0647	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-232</b>	<b>0.972</b>		0.240	0.260		0.0889	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Thorium-234	-1.11	U	1.27	1.28		1.50	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-235	0.0461	U	0.306	0.306		0.635	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-238	-1.11	U	1.27	1.28		1.50	pCi/g	08/03/18 12:11	08/24/18 08:44	1

Client Sample ID: PE2-RSYE2-U12-S007

Lab Sample ID: 160-29899-7

Date Collected: 07/26/18 09:33

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.663</b>		0.201	0.212		0.0743	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Actinium-227	-0.0364	U	0.858	0.858		0.705	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Bismuth-212	0.349	U	0.699	0.700		0.530	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Bismuth-214</b>	<b>0.653</b>		0.152	0.167		0.0431	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cesium-137	-0.0708	U	0.0869	0.0872	0.0700	0.0869	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cobalt-60	0.00593	U	0.0738	0.0738	0.200	0.0388	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-210</b>	<b>1.07</b>		1.35	1.36		0.877	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-212</b>	<b>0.667</b>		0.120	0.148		0.0538	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-214</b>	<b>0.503</b>		0.139	0.148		0.0708	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Potassium-40</b>	<b>8.35</b>		1.56	1.78		0.314	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Protactinium-231	-0.344	U	3.18	3.18		2.61	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-226</b>	<b>0.653</b>		0.152	0.167	0.700	0.0431	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-228</b>	<b>0.663</b>		0.201	0.212		0.0743	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thallium-208</b>	<b>0.230</b>		0.0628	0.0672		0.0145	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-228</b>	<b>0.667</b>		0.120	0.148		0.0538	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-232</b>	<b>0.663</b>		0.201	0.212		0.0743	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-234</b>	<b>0.902</b>		0.608	0.616		0.792	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-235	-0.0218	U	0.281	0.281		0.567	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Uranium-238</b>	<b>0.902</b>		0.608	0.616		0.792	pCi/g	08/03/18 12:11	08/24/18 08:44	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

**Client Sample ID: PE2-RSYE2-U12-S008**

**Lab Sample ID: 160-29899-8**

Date Collected: 07/26/18 09:38

Matrix: Solid

Date Received: 08/01/18 09:05

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.778</b>		0.229	0.243		0.0394	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Actinium-227	-0.468	U	1.14	1.14		0.923	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Bismuth-212	-0.594	U	1.00	1.00		0.970	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Bismuth-214</b>	<b>0.620</b>		0.221	0.229		0.0833	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cesium-137	0.0290	U	0.0923	0.0923	0.0700	0.0736	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cobalt-60	-0.0646	U	0.125	0.125	0.200	0.0729	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-210</b>	<b>1.63</b>		1.68	1.69		1.14	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-212</b>	<b>0.696</b>		0.129	0.148		0.0605	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-214</b>	<b>0.698</b>		0.157	0.172		0.0896	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Potassium-40</b>	<b>8.72</b>		1.61	1.83		0.436	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Protactinium-231	-1.18	U	3.86	3.86		3.14	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-226</b>	<b>0.620</b>		0.221	0.229	0.700	0.0833	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-228</b>	<b>0.778</b>		0.229	0.243		0.0394	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thallium-208</b>	<b>0.272</b>		0.107	0.111		0.0430	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-228</b>	<b>0.696</b>		0.129	0.148		0.0605	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-232</b>	<b>0.778</b>		0.229	0.243		0.0394	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-234</b>	<b>1.45</b>		1.89	1.90		1.08	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-235	0.0716	U	0.436	0.436		0.698	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Uranium-238</b>	<b>1.45</b>		1.89	1.90		1.08	pCi/g	08/03/18 12:11	08/24/18 08:44	1

**Client Sample ID: PE2-RSYE2-U12-S009**

**Lab Sample ID: 160-29899-9**

Date Collected: 07/26/18 09:43

Matrix: Solid

Date Received: 08/01/18 09:05

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.562</b>		0.157	0.167		0.0320	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Actinium-227	0.0696	U	0.157	0.157		0.667	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Bismuth-212	0.115	U	1.17	1.17		0.960	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Bismuth-214</b>	<b>0.427</b>		0.128	0.135		0.0470	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cesium-137	-0.0674	U	0.0785	0.0789	0.0700	0.0669	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Cobalt-60	0.0181	U	0.0674	0.0675	0.200	0.0374	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Lead-210	0.273	U	1.56	1.56		1.27	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-212</b>	<b>0.554</b>		0.102	0.125		0.0490	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Lead-214</b>	<b>0.519</b>		0.102	0.115		0.0385	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Potassium-40</b>	<b>8.57</b>		1.42	1.67		0.255	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Protactinium-231	-1.03	U	3.22	3.22		2.63	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-226</b>	<b>0.427</b>		0.128	0.135	0.700	0.0470	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Radium-228</b>	<b>0.562</b>		0.157	0.167		0.0320	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thallium-208</b>	<b>0.254</b>		0.0674	0.0724		0.0237	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-228</b>	<b>0.554</b>		0.102	0.125		0.0490	pCi/g	08/03/18 12:11	08/24/18 08:44	1
<b>Thorium-232</b>	<b>0.562</b>		0.157	0.167		0.0320	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Thorium-234	-1.64	U	1.52	1.53		1.47	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-235	-0.261	U	0.463	0.464		0.517	pCi/g	08/03/18 12:11	08/24/18 08:44	1
Uranium-238	-1.64	U	1.52	1.53		1.47	pCi/g	08/03/18 12:11	08/24/18 08:44	1

## Client Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S010

Lab Sample ID: 160-29899-10

Date Collected: 07/26/18 09:48

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.636</b>		0.143	0.157		0.0270	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Actinium-227	0.141	U	0.644	0.644		0.524	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Bismuth-212	0.332	U	0.579	0.580		0.441	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Bismuth-214</b>	<b>0.249</b>		0.104	0.107		0.134	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Cesium-137	0.0193	U	0.0509	0.0509	0.0700	0.0400	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Cobalt-60</b>	<b>0.0460</b>		0.0306	0.0309	0.200	0.0111	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Lead-210	-0.381	U	1.33	1.33		1.11	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Lead-212</b>	<b>0.420</b>		0.0874	0.103		0.0490	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Lead-214</b>	<b>0.505</b>		0.102	0.115		0.0478	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Potassium-40</b>	<b>7.79</b>		1.25	1.48		0.195	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Protactinium-231	0.000	U	0.591	0.591		1.83	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Radium-226</b>	<b>0.249</b>		0.104	0.107	0.700	0.134	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Radium-228</b>	<b>0.636</b>		0.143	0.157		0.0270	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Thallium-208</b>	<b>0.230</b>		0.0510	0.0563		0.00922	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Thorium-228</b>	<b>0.420</b>		0.0874	0.103		0.0490	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Thorium-232</b>	<b>0.636</b>		0.143	0.157		0.0270	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Thorium-234</b>	<b>0.640</b>		0.985	0.987		0.624	pCi/g	08/03/18 12:11	08/24/18 08:45	1
Uranium-235	0.214	U	0.224	0.225		0.286	pCi/g	08/03/18 12:11	08/24/18 08:45	1
<b>Uranium-238</b>	<b>0.640</b>		0.985	0.987		0.624	pCi/g	08/03/18 12:11	08/24/18 08:45	1

Client Sample ID: PE2-RSYE2-U12-S011

Lab Sample ID: 160-29899-11

Date Collected: 07/26/18 09:53

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	-0.00795	U	0.0651	0.0651	0.331	0.0542	pCi/g	08/07/18 18:44	08/23/18 05:58	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	84.4		40 - 110					08/07/18 18:44	08/23/18 05:58	1

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.513</b>		0.191	0.198		0.0412	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Actinium-227	-0.194	U	0.691	0.691		0.468	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Bismuth-212	0.393	U	0.840	0.841		0.647	pCi/g	08/03/18 12:11	08/24/18 08:47	1
<b>Bismuth-214</b>	<b>0.639</b>		0.161	0.174		0.0478	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Cesium-137	-0.0205	U	0.0502	0.0503	0.0700	0.0235	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Cobalt-60	-0.0400	U	0.110	0.110	0.200	0.0538	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Lead-210	0.827	U	1.43	1.44		0.901	pCi/g	08/03/18 12:11	08/24/18 08:47	1
<b>Lead-212</b>	<b>0.503</b>		0.113	0.130		0.0574	pCi/g	08/03/18 12:11	08/24/18 08:47	1
<b>Lead-214</b>	<b>0.548</b>		0.137	0.149		0.0601	pCi/g	08/03/18 12:11	08/24/18 08:47	1
<b>Potassium-40</b>	<b>9.22</b>		1.68	1.92		0.337	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Protactinium-231	0.343	U	2.95	2.95		2.42	pCi/g	08/03/18 12:11	08/24/18 08:47	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

**Client Sample ID: PE2-RSYE2-U12-S011**

**Lab Sample ID: 160-29899-11**

Date Collected: 07/26/18 09:53

Matrix: Solid

Date Received: 08/01/18 09:05

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.639		0.161	0.174	0.700	0.0478	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Radium-228	0.513		0.191	0.198		0.0412	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Thallium-208	0.221		0.0768	0.0802		0.0258	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Thorium-228	0.503		0.113	0.130		0.0574	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Thorium-232	0.513		0.191	0.198		0.0412	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Thorium-234	0.940		1.32	1.32		0.829	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Uranium-235	0.106	U	0.307	0.307		0.247	pCi/g	08/03/18 12:11	08/24/18 08:47	1
Uranium-238	0.940		1.32	1.32		0.829	pCi/g	08/03/18 12:11	08/24/18 08:47	1

**Client Sample ID: PE2-RSYE2-U12-S012**

**Lab Sample ID: 160-29899-12**

Date Collected: 07/26/18 09:58

Matrix: Solid

Date Received: 08/01/18 09:05

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.449		0.183	0.189		0.0689	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Actinium-227	-0.332	U	0.589	0.590		0.537	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Bismuth-212	-0.226	U	0.668	0.669		0.534	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Bismuth-214	0.444		0.111	0.120		0.0422	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cesium-137	-0.0484	U	0.0781	0.0783	0.0700	0.0618	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cobalt-60	0.0170	U	0.0303	0.0303	0.200	0.0203	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Lead-210	0.205	U	1.24	1.24		1.02	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Lead-212	0.535		0.0875	0.112		0.0415	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Lead-214	0.493		0.0911	0.105		0.0438	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Potassium-40	7.79		1.11	1.37		0.230	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Protactinium-231	0.000	U	0.394	0.394		1.84	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Radium-226	0.444		0.111	0.120	0.700	0.0422	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Radium-228	0.449		0.183	0.189		0.0689	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thallium-208	0.214		0.0557	0.0599		0.0188	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thorium-228	0.535		0.0875	0.112		0.0415	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thorium-232	0.449		0.183	0.189		0.0689	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thorium-234	0.536	U	1.14	1.14		0.916	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-235	0.111	U	0.332	0.333		0.336	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-238	0.536	U	1.14	1.14		0.916	pCi/g	08/03/18 12:11	08/24/18 10:05	1

**Client Sample ID: PE2-RSYE2-U12-S013**

**Lab Sample ID: 160-29899-13**

Date Collected: 07/26/18 10:06

Matrix: Solid

Date Received: 08/01/18 09:05

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.652		0.284	0.292		0.115	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Actinium-227	0.0157	U	0.0341	0.0341		0.727	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Bismuth-212	0.440	U	0.850	0.851		0.664	pCi/g	08/03/18 12:11	08/24/18 10:06	1

## Client Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S013

Lab Sample ID: 160-29899-13

Date Collected: 07/26/18 10:06

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Bismuth-214</b>	<b>0.634</b>		0.166	0.178		0.0533	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Cesium-137	-0.0207	U	0.0775	0.0775	0.0700	0.0623	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Cobalt-60	-0.0623	U	0.115	0.115	0.200	0.0546	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-210</b>	<b>1.79</b>		1.42	1.44		0.938	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-212</b>	<b>0.660</b>		0.109	0.129		0.0492	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-214</b>	<b>0.530</b>		0.141	0.151		0.0611	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Potassium-40</b>	<b>9.71</b>		1.39	1.70		0.115	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Protactinium-231	0.663	U	2.13	2.13		2.33	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Radium-226</b>	<b>0.634</b>		0.166	0.178	0.700	0.0533	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Radium-228</b>	<b>0.652</b>		0.284	0.292		0.115	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thallium-208</b>	<b>0.316</b>		0.0771	0.0835		0.0239	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thorium-228</b>	<b>0.660</b>		0.109	0.129		0.0492	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thorium-232</b>	<b>0.652</b>		0.284	0.292		0.115	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Thorium-234	-0.275	U	1.73	1.73		1.43	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Uranium-235	0.000	U	0.237	0.237		0.477	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Uranium-238	-0.275	U	1.73	1.73		1.43	pCi/g	08/03/18 12:11	08/24/18 10:06	1

Client Sample ID: PE2-RSYE2-U12-S014

Lab Sample ID: 160-29899-14

Date Collected: 07/26/18 10:11

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.807</b>		0.187	0.205		0.0306	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Actinium-227	-0.332	U	0.461	0.462		0.506	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Bismuth-212	-0.0139	U	0.971	0.971		0.652	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Bismuth-214</b>	<b>0.653</b>		0.137	0.153		0.0412	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cesium-137	-0.00164	U	0.0791	0.0791	0.0700	0.0439	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cobalt-60	0.00147	U	0.00526	0.00526	0.200	0.0485	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Lead-210</b>	<b>0.934</b>		0.971	0.978		0.674	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Lead-212</b>	<b>0.576</b>		0.0981	0.123		0.0419	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Lead-214</b>	<b>0.533</b>		0.126	0.137		0.0612	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Potassium-40</b>	<b>8.70</b>		1.39	1.65		0.237	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Protactinium-231	-0.747	U	2.68	2.68		2.18	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Radium-226</b>	<b>0.653</b>		0.137	0.153	0.700	0.0412	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Radium-228</b>	<b>0.807</b>		0.187	0.205		0.0306	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thallium-208</b>	<b>0.225</b>		0.0569	0.0614		0.0158	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thorium-228</b>	<b>0.576</b>		0.0981	0.123		0.0419	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thorium-232</b>	<b>0.807</b>		0.187	0.205		0.0306	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thorium-234	0.374	U	0.847	0.848		0.611	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-235	0.114	U	0.335	0.335		0.271	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-238	0.374	U	0.847	0.848		0.611	pCi/g	08/03/18 12:11	08/24/18 10:05	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

**Client Sample ID: PE2-RSYE2-U12-S015**

**Lab Sample ID: 160-29899-15**

**Date Collected: 07/26/18 10:16**

**Matrix: Solid**

**Date Received: 08/01/18 09:05**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.654</b>		0.327	0.334		0.137	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Actinium-227	-0.407	U	0.971	0.972		0.785	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Bismuth-212	-0.172	U	0.911	0.911		0.742	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Bismuth-214</b>	<b>0.613</b>		0.138	0.152		0.0394	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Cesium-137	0.0310	U	0.0616	0.0617	0.0700	0.0473	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Cobalt-60</b>	<b>0.0259</b>		0.0297	0.0299	0.200	0.0143	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-210</b>	<b>1.76</b>		1.29	1.31		0.765	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-212</b>	<b>0.582</b>		0.112	0.135		0.0541	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Lead-214</b>	<b>0.528</b>		0.134	0.145		0.0553	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Potassium-40</b>	<b>9.26</b>		1.56	1.83		0.287	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Protactinium-231	-0.920	U	3.35	3.35		2.73	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Radium-226</b>	<b>0.613</b>		0.138	0.152	0.700	0.0394	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Radium-228</b>	<b>0.654</b>		0.327	0.334		0.137	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thallium-208</b>	<b>0.241</b>		0.0605	0.0655		0.0133	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thorium-228</b>	<b>0.582</b>		0.112	0.135		0.0541	pCi/g	08/03/18 12:11	08/24/18 10:06	1
<b>Thorium-232</b>	<b>0.654</b>		0.327	0.334		0.137	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Thorium-234	-0.241	U	1.73	1.73		1.43	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Uranium-235	-0.0296	U	0.251	0.251		0.558	pCi/g	08/03/18 12:11	08/24/18 10:06	1
Uranium-238	-0.241	U	1.73	1.73		1.43	pCi/g	08/03/18 12:11	08/24/18 10:06	1

**Client Sample ID: PE2-RSYE2-U12-S016**

**Lab Sample ID: 160-29899-16**

**Date Collected: 07/26/18 10:21**

**Matrix: Solid**

**Date Received: 08/01/18 09:05**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.555</b>		0.169	0.178		0.121	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Actinium-227	0.0947	U	0.190	0.190		0.472	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Bismuth-212	0.377	U	0.774	0.775		0.605	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Bismuth-214</b>	<b>0.489</b>		0.145	0.154		0.0642	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Cesium-137	0.0193	U	0.0664	0.0664	0.0700	0.0531	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Cobalt-60	0.00887	U	0.0530	0.0530	0.200	0.0359	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Lead-210</b>	<b>1.44</b>		1.71	1.72		1.03	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Lead-212</b>	<b>0.509</b>		0.102	0.121		0.0528	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Lead-214</b>	<b>0.624</b>		0.134	0.149		0.0527	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Potassium-40</b>	<b>7.14</b>		1.22	1.42		0.294	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Protactinium-231	-0.715	U	2.48	2.48		2.02	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Radium-226</b>	<b>0.489</b>		0.145	0.154	0.700	0.0642	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Radium-228</b>	<b>0.555</b>		0.169	0.178		0.121	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thallium-208</b>	<b>0.243</b>		0.0629	0.0678		0.0218	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thorium-228</b>	<b>0.509</b>		0.102	0.121		0.0528	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thorium-232</b>	<b>0.555</b>		0.169	0.178		0.121	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Thorium-234	-0.237	U	1.34	1.34		1.11	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Uranium-235	0.109	U	0.279	0.280		0.311	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Uranium-238	-0.237	U	1.34	1.34		1.11	pCi/g	08/03/18 12:11	08/24/18 10:07	1

## Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

Client Sample ID: PE2-RSYE2-U12-S017

Lab Sample ID: 160-29899-17

Date Collected: 07/26/18 10:26

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.852</b>		0.227	0.243		0.0362	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Actinium-227	0.0551	U	0.583	0.583		0.773	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Bismuth-212	0.686	U	1.39	1.40		1.11	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Bismuth-214</b>	<b>0.670</b>		0.177	0.190		0.0665	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cesium-137	0.0473	U	0.0864	0.0865	0.0700	0.0673	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Cobalt-60	-0.0613	U	0.0970	0.0972	0.200	0.0580	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Lead-210	-1.16	U	2.01	2.02		1.70	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Lead-212</b>	<b>0.679</b>		0.117	0.137		0.0484	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Lead-214</b>	<b>0.601</b>		0.147	0.159		0.0761	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Potassium-40</b>	<b>9.15</b>		1.70	1.94		0.510	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Protactinium-231	0.0000001	U	3.41	3.41		2.81	pCi/g	08/03/18 12:11	08/24/18 10:05	1
	28									
<b>Radium-226</b>	<b>0.670</b>		0.177	0.190	0.700	0.0665	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Radium-228</b>	<b>0.852</b>		0.227	0.243		0.0362	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thallium-208</b>	<b>0.292</b>		0.0712	0.0771		0.0191	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thorium-228</b>	<b>0.679</b>		0.117	0.137		0.0484	pCi/g	08/03/18 12:11	08/24/18 10:05	1
<b>Thorium-232</b>	<b>0.852</b>		0.227	0.243		0.0362	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Thorium-234	-0.0484	U	1.63	1.63		1.33	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-235	-0.236	U	0.823	0.823		0.673	pCi/g	08/03/18 12:11	08/24/18 10:05	1
Uranium-238	-0.0484	U	1.63	1.63		1.33	pCi/g	08/03/18 12:11	08/24/18 10:05	1

Client Sample ID: PE2-RSYE2-U12-S018

Lab Sample ID: 160-29899-18

Date Collected: 07/26/18 10:31

Matrix: Solid

Date Received: 08/01/18 09:05

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.487</b>		0.169	0.177		0.0344	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Actinium-227	0.260	U	0.494	0.495		0.557	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Bismuth-212	0.405	U	0.723	0.724		0.550	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Bismuth-214</b>	<b>0.519</b>		0.156	0.165		0.0589	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Cesium-137	0.0000960	U	0.0682	0.0682	0.0700	0.0558	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Cobalt-60	0.0227	U	0.0383	0.0383	0.200	0.0246	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Lead-210	-0.867	U	1.12	1.12		1.49	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Lead-212</b>	<b>0.561</b>		0.138	0.156		0.0886	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Lead-214</b>	<b>0.515</b>		0.114	0.126		0.0524	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Potassium-40</b>	<b>8.13</b>		1.44	1.66		0.274	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Protactinium-231	0.000	U	1.02	1.02		2.33	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Radium-226</b>	<b>0.519</b>		0.156	0.165	0.700	0.0589	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Radium-228</b>	<b>0.487</b>		0.169	0.177		0.0344	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thallium-208</b>	<b>0.231</b>		0.0770	0.0806		0.0291	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thorium-228</b>	<b>0.561</b>		0.138	0.156		0.0886	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thorium-232</b>	<b>0.487</b>		0.169	0.177		0.0344	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Thorium-234</b>	<b>1.77</b>		1.14	1.15		0.701	pCi/g	08/03/18 12:11	08/24/18 10:07	1
Uranium-235	-0.0543	U	0.349	0.349		0.424	pCi/g	08/03/18 12:11	08/24/18 10:07	1
<b>Uranium-238</b>	<b>1.77</b>		1.14	1.15		0.701	pCi/g	08/03/18 12:11	08/24/18 10:07	1

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

## Method: 905.0 - Total Beta Strontium (GFPC)

**Lab Sample ID: MB 160-380968/22-A**  
**Matrix: Solid**  
**Analysis Batch: 384724**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 380968**

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	-0.02050	U	0.0574	0.0574	0.331	0.0492	pCi/g	08/07/18 18:44	08/23/18 06:02	1
Carrier	MB MB		Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	%Yield	Qualifier	Limits					08/07/18 18:44	08/23/18 06:02	1
	81.9		40 - 110							

**Lab Sample ID: LCS 160-380968/1-A**  
**Matrix: Solid**  
**Analysis Batch: 384726**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 380968**

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Total Beta Strontium	8.20	7.829		0.640	0.331	0.0503	pCi/g	95	75 - 125
Carrier	LCS	LCS	Limits		Prepared	Analyzed	Dil Fac		
Sr Carrier	%Yield	Qualifier	Limits					08/07/18 18:44	08/23/18 06:02
	83.0		40 - 110						

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-380160/1-A**  
**Matrix: Solid**  
**Analysis Batch: 385096**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 380160**

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.03488	U	0.0745	0.0746		0.0883	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Actinium-227	0.1516	U	0.429	0.430		0.284	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Bismuth-212	-0.4113	U	0.518	0.519		0.658	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Bismuth-214	-0.01523	U	0.0989	0.0989		0.0825	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Cesium-137	0.02977	U	0.0589	0.0590	0.0700	0.0445	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Cobalt-60	0.03474		0.0311	0.0313	0.200	0.0162	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Lead-210	-0.5520	U	1.14	1.14		0.871	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Lead-212	-0.03509	U	0.0707	0.0708		0.0790	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Lead-214	-0.002004	U	0.104	0.104		0.0851	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Potassium-40	-0.2623	U	0.859	0.859		0.316	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Protactinium-231	-0.2312	U	2.87	2.87		2.35	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Radium-226	-0.01523	U	0.0989	0.0989	0.700	0.0825	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Radium-228	0.03488	U	0.0745	0.0746		0.0883	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Thallium-208	0.02564	U	0.0500	0.0500		0.0287	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Thorium-228	-0.03509	U	0.0707	0.0708		0.0790	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Thorium-232	0.03488	U	0.0745	0.0746		0.0883	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Thorium-234	0.2934	U	0.794	0.795		0.622	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Uranium-235	0.004810	U	0.0531	0.0531		0.198	pCi/g	08/03/18 12:11	08/24/18 12:10	1
Uranium-238	0.2934	U	0.794	0.795		0.622	pCi/g	08/03/18 12:11	08/24/18 12:10	1

## QC Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

### Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID: LCS 160-380160/2-A**  
**Matrix: Solid**  
**Analysis Batch: 385100**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 380160**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	98.97		11.7		0.643	pCi/g	102	87 - 116
Cesium-137	28.2	30.99		3.26	0.0700	0.145	pCi/g	110	87 - 120
Cobalt-60	12.8	13.51		1.41	0.200	0.0818	pCi/g	105	87 - 115

**Lab Sample ID: 160-29899-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 385099**

**Client Sample ID: PE2-RS YE2-U12-S001**  
**Prep Type: Total/NA**  
**Prep Batch: 380160**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.758		0.6748		0.161		0.0476	pCi/g	0.19	1
Actinium-227	0.0298	U	-0.3053	U	0.641		0.595	pCi/g	0.48	1
Bismuth-212	-0.0471	U	0.3326	U	0.587		0.450	pCi/g	0.22	1
Bismuth-214	0.746		0.6168		0.146		0.0437	pCi/g	0.37	1
Cesium-137	-0.0605	U	0.002846	U	0.0561	0.0700	0.0459	pCi/g	0.40	1
Cobalt-60	-0.0563	U	-0.03623	U	0.0966	0.200	0.0464	pCi/g	0.11	1
Lead-210	-0.138	U	0.2540	U	1.35		1.10	pCi/g	0.11	1
Lead-212	0.697		0.6217		0.128		0.0457	pCi/g	0.26	1
Lead-214	0.643		0.6622		0.170		0.0592	pCi/g	0.06	1
Potassium-40	9.26		8.898		1.56		0.262	pCi/g	0.10	1
Protactinium-231	-0.136	U	0.0000	U	0.768		2.06	pCi/g	0.03	1
Radium-226	0.746		0.6168		0.146	0.700	0.0437	pCi/g	0.37	1
Radium-228	0.758		0.6748		0.161		0.0476	pCi/g	0.19	1
Thallium-208	0.273		0.2345		0.0651		0.0185	pCi/g	0.26	1
Thorium-228	0.697		0.6217		0.128		0.0457	pCi/g	0.26	1
Thorium-232	0.758		0.6748		0.161		0.0476	pCi/g	0.19	1
Thorium-234	-0.194	U	-0.00230	U	1.31		1.08	pCi/g	0.06	1
Uranium-235	-0.257	U	0.1174	U	0.243		0.442	pCi/g	0.80	1
Uranium-238	-0.194	U	-0.00230	U	1.31		1.08	pCi/g	0.06	1

# QC Association Summary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

## Rad

### Leach Batch: 379760

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29899-1	PE2-RSYE2-U12-S001	Total/NA	Solid	Dry and Grind	
160-29899-2	PE2-RSYE2-U12-S002	Total/NA	Solid	Dry and Grind	
160-29899-3	PE2-RSYE2-U12-S003	Total/NA	Solid	Dry and Grind	
160-29899-4	PE2-RSYE2-U12-S004	Total/NA	Solid	Dry and Grind	
160-29899-5	PE2-RSYE2-U12-S005	Total/NA	Solid	Dry and Grind	
160-29899-6	PE2-RSYE2-U12-S006	Total/NA	Solid	Dry and Grind	
160-29899-7	PE2-RSYE2-U12-S007	Total/NA	Solid	Dry and Grind	
160-29899-8	PE2-RSYE2-U12-S008	Total/NA	Solid	Dry and Grind	
160-29899-9	PE2-RSYE2-U12-S009	Total/NA	Solid	Dry and Grind	
160-29899-10	PE2-RSYE2-U12-S010	Total/NA	Solid	Dry and Grind	
160-29899-11	PE2-RSYE2-U12-S011	Total/NA	Solid	Dry and Grind	
160-29899-12	PE2-RSYE2-U12-S012	Total/NA	Solid	Dry and Grind	
160-29899-13	PE2-RSYE2-U12-S013	Total/NA	Solid	Dry and Grind	
160-29899-14	PE2-RSYE2-U12-S014	Total/NA	Solid	Dry and Grind	
160-29899-15	PE2-RSYE2-U12-S015	Total/NA	Solid	Dry and Grind	
160-29899-16	PE2-RSYE2-U12-S016	Total/NA	Solid	Dry and Grind	
160-29899-17	PE2-RSYE2-U12-S017	Total/NA	Solid	Dry and Grind	
160-29899-18	PE2-RSYE2-U12-S018	Total/NA	Solid	Dry and Grind	
160-29899-1 DU	PE2-RSYE2-U12-S001	Total/NA	Solid	Dry and Grind	

### Prep Batch: 380160

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29899-1	PE2-RSYE2-U12-S001	Total/NA	Solid	Fill_Geo-21	379760
160-29899-2	PE2-RSYE2-U12-S002	Total/NA	Solid	Fill_Geo-21	379760
160-29899-3	PE2-RSYE2-U12-S003	Total/NA	Solid	Fill_Geo-21	379760
160-29899-4	PE2-RSYE2-U12-S004	Total/NA	Solid	Fill_Geo-21	379760
160-29899-5	PE2-RSYE2-U12-S005	Total/NA	Solid	Fill_Geo-21	379760
160-29899-6	PE2-RSYE2-U12-S006	Total/NA	Solid	Fill_Geo-21	379760
160-29899-7	PE2-RSYE2-U12-S007	Total/NA	Solid	Fill_Geo-21	379760
160-29899-8	PE2-RSYE2-U12-S008	Total/NA	Solid	Fill_Geo-21	379760
160-29899-9	PE2-RSYE2-U12-S009	Total/NA	Solid	Fill_Geo-21	379760
160-29899-10	PE2-RSYE2-U12-S010	Total/NA	Solid	Fill_Geo-21	379760
160-29899-11	PE2-RSYE2-U12-S011	Total/NA	Solid	Fill_Geo-21	379760
160-29899-12	PE2-RSYE2-U12-S012	Total/NA	Solid	Fill_Geo-21	379760
160-29899-13	PE2-RSYE2-U12-S013	Total/NA	Solid	Fill_Geo-21	379760
160-29899-14	PE2-RSYE2-U12-S014	Total/NA	Solid	Fill_Geo-21	379760
160-29899-15	PE2-RSYE2-U12-S015	Total/NA	Solid	Fill_Geo-21	379760
160-29899-16	PE2-RSYE2-U12-S016	Total/NA	Solid	Fill_Geo-21	379760
160-29899-17	PE2-RSYE2-U12-S017	Total/NA	Solid	Fill_Geo-21	379760
160-29899-18	PE2-RSYE2-U12-S018	Total/NA	Solid	Fill_Geo-21	379760
MB 160-380160/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-380160/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29899-1 DU	PE2-RSYE2-U12-S001	Total/NA	Solid	Fill_Geo-21	379760

### Prep Batch: 380968

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29899-1	PE2-RSYE2-U12-S001	Total/NA	Solid	DPS-0	379760
160-29899-11	PE2-RSYE2-U12-S011	Total/NA	Solid	DPS-0	379760
MB 160-380968/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-380968/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

## Tracer/Carrier Summary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29899-2

**Method: 905.0 - Total Beta Strontium (GFPC)**

**Matrix: Solid**

**Prep Type: Total/NA**

**Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)
160-29899-1	PE2-RSYE2-U12-S001	83.0
160-29899-11	PE2-RSYE2-U12-S011	84.4
LCS 160-380968/1-A	Lab Control Sample	83.0
MB 160-380968/22-A	Method Blank	81.9

**Tracer/Carrier Legend**

Sr Carrier = Sr Carrier

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# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-29930-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

Authorized for release by:  
8/29/2018 10:44:56 AM

Rhonda Ridenhower, Manager of Project Management  
(314)298-8566  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

**Job ID: 160-29930-2**

**Laboratory: TestAmerica St. Louis**

### Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: Hunters Point Naval Shipyard - Parcel E2**

**Report Number: 160-29930-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

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### Job ID: 160-29930-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 08/02/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.0 C.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYE2-U12-LLRO-S001 (160-29930-1), PE2-RSYE2-U12-LLRO-S002 (160-29930-2), PE2-RSYE2-U12-LLRO-S003 (160-29930-3) and PE2-RSYE2-U12-LLRO-S004 (160-29930-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 08/02/2018, prepared on 08/06/2018 and analyzed on 08/27/2018.

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU: PE2-RSYE2-U12-LLRO-S003 (160-29930-3) This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

# CHAIN OF CUSTODY

Ref. Document # PE2\_RSYE2\_USE12\_LLRO\_072618-1#600

Page 1 of 1

Project Number: 500506

CTO-013 RSYE2 USE 12 Low Level  
Radiological Object # 072618-1

Project Name: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 8.1.18

Waybill Number: 126645451318034431

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Rudehower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): JOAQUIN RAMIREZ

Sample ID Number	Sample Description	Date	Time	Method	Matrix	# of containers	Preservative (water)	Preservative (soil)	Container Type
PE2-RSYE2-U12-LLRO-S001	Parcel E-2 RSYE2 USE 12 Surrounding Commodity #072618-1 (NW)	7/26/18	1240	G	SO	1	16 oz. plastic jar		
PE2-RSYE2-U12-LLRO-S002	Parcel E-2 RSYE2 USE 12 Surrounding Commodity #072618-1 (NE)	7/26/18	1244	G	SO	1	16 oz. plastic jar		
PE2-RSYE2-U12-LLRO-S003	Parcel E-2 RSYE2 USE 12 Surrounding Commodity #072618-1 (SE)	7/26/18	1248	G	SO	1	16 oz. plastic jar		
PE2-RSYE2-U12-LLRO-S004	Parcel E-2 RSYE2 USE 12 Surrounding Commodity #072618-1 (SW)	7/26/18	1252	G	SO	1	16 oz. plastic jar		

Gamma Spec (EPA 191.1M) - (7 day in-growth preliminary results and full 21 day in-growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Dose Rate $\mu$ R/Hr
N/A	N/A	N/A	
X			5
X			5
X			5
X			5



160-29930 Chain of Custody

## Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g. 7 days ingrown draft and follow with 21 days final.

Level O/QC Required:  24-hr  3-day  10-day  1  II  III

Project Specific:

Standard TAT -10-day

Relinquished By: JOAQUIN RAMIREZ Date: 8.1.18 Time: 1000 Received By: EDDIE KALOMBO Date: 8.1.18 Time: 1000

Relinquished By: EDDIE KALOMBO Date: 8.1.18 Time: 1600 Received By: Nels Johnson Date: 8-2-18 Time: 0830

Relinquished By: Date: Time: Received By: Date: Time: Received By: Date: Time: Received By: Date: Time:

Method Codes: C = Composite G = Grab

Matrix Codes: SO = Soil DW = Drinking Water SL = Sludge GW = Ground Water WW = Waste Water CP = Chip Samples A = Air ABS=Asbestos, PO=Pipe Opening



## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29930-2

**Login Number: 29930****List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

## Definitions/Glossary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

### Qualifiers

#### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

## Method Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

**Protocol References:**

DOE = U.S. Department of Energy  
None = None

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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# Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29930-1	PE2-RSYE2-U12-LLRO-S001	Solid	07/26/18 12:40	08/02/18 08:30
160-29930-2	PE2-RSYE2-U12-LLRO-S002	Solid	07/26/18 12:44	08/02/18 08:30
160-29930-3	PE2-RSYE2-U12-LLRO-S003	Solid	07/26/18 12:48	08/02/18 08:30
160-29930-4	PE2-RSYE2-U12-LLRO-S004	Solid	07/26/18 12:52	08/02/18 08:30

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## Client Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

Client Sample ID: PE2-RSYE2-U12-LLRO-S001

Lab Sample ID: 160-29930-1

Date Collected: 07/26/18 12:40

Matrix: Solid

Date Received: 08/02/18 08:30

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.803</b>		0.188	0.205		0.0322	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Actinium-227	0.0506	U	0.109	0.109		0.729	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Bismuth-212	-0.673	U	1.21	1.21		0.952	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Bismuth-214</b>	<b>0.514</b>		0.135	0.145		0.0428	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Cesium-137	0.0378	U	0.0696	0.0697	0.0700	0.0539	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Cobalt-60	0.00177	U	0.0598	0.0598	0.200	0.0295	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Lead-210</b>	<b>1.20</b>		1.32	1.33		0.929	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Lead-212</b>	<b>0.592</b>		0.110	0.126		0.0515	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Lead-214</b>	<b>0.569</b>		0.147	0.158		0.0602	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Potassium-40</b>	<b>9.55</b>		1.43	1.73		0.125	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Protactinium-231	-0.884	U	3.33	3.33		2.71	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Radium-226</b>	<b>0.514</b>		0.135	0.145	0.700	0.0428	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Radium-228</b>	<b>0.803</b>		0.188	0.205		0.0322	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Thallium-208</b>	<b>0.227</b>		0.0717	0.0753		0.0275	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Thorium-228</b>	<b>0.592</b>		0.110	0.126		0.0515	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Thorium-232</b>	<b>0.803</b>		0.188	0.205		0.0322	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Thorium-234</b>	<b>0.919</b>		1.30	1.31		0.833	pCi/g	08/06/18 17:13	08/27/18 07:58	1
Uranium-235	0.114	U	0.262	0.262		0.479	pCi/g	08/06/18 17:13	08/27/18 07:58	1
<b>Uranium-238</b>	<b>0.919</b>		1.30	1.31		0.833	pCi/g	08/06/18 17:13	08/27/18 07:58	1

Client Sample ID: PE2-RSYE2-U12-LLRO-S002

Lab Sample ID: 160-29930-2

Date Collected: 07/26/18 12:44

Matrix: Solid

Date Received: 08/02/18 08:30

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.839</b>		0.158	0.180		0.0313	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Actinium-227	0.0554	U	0.683	0.683		0.470	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Bismuth-212	0.454	U	0.805	0.807		0.622	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Bismuth-214</b>	<b>0.525</b>		0.147	0.157		0.0541	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Cesium-137	0.0228	U	0.0490	0.0490	0.0700	0.0375	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Cobalt-60	0.0142	U	0.0586	0.0586	0.200	0.0287	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Lead-210</b>	<b>0.712</b>		1.01	1.01		0.701	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Lead-212	0.0181	U	0.157	0.157		0.129	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Lead-214</b>	<b>0.607</b>		0.105	0.123		0.0461	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Potassium-40</b>	<b>8.04</b>		1.35	1.58		0.242	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Protactinium-231	0.298	U	1.28	1.28		2.02	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Radium-226</b>	<b>0.525</b>		0.147	0.157	0.700	0.0541	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Radium-228</b>	<b>0.839</b>		0.158	0.180		0.0313	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thallium-208</b>	<b>0.143</b>		0.0568	0.0587		0.0256	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Thorium-228	0.0181	U	0.157	0.157		0.129	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thorium-232</b>	<b>0.839</b>		0.158	0.180		0.0313	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thorium-234</b>	<b>1.06</b>		0.832	0.839		0.611	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Uranium-235	-0.00924	U	0.304	0.304		0.313	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Uranium-238</b>	<b>1.06</b>		0.832	0.839		0.611	pCi/g	08/06/18 17:13	08/27/18 07:59	1

## Client Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

Client Sample ID: PE2-RSYE2-U12-LLRO-S003

Lab Sample ID: 160-29930-3

Date Collected: 07/26/18 12:48

Matrix: Solid

Date Received: 08/02/18 08:30

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.164	U	0.297	0.298		0.254	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Actinium-227	-0.462	U	0.995	0.996		0.637	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Bismuth-212	0.228	U	0.836	0.837		0.665	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Bismuth-214</b>	<b>0.682</b>		0.165	0.179		0.0545	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Cesium-137	-0.0367	U	0.0218	0.0221	0.0700	0.0587	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Cobalt-60	0.00578	U	0.0719	0.0719	0.200	0.0378	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Lead-210	-0.0256	U	1.79	1.79		1.47	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Lead-212</b>	<b>0.596</b>		0.113	0.137		0.0514	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Lead-214</b>	<b>0.479</b>		0.149	0.157		0.0620	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Potassium-40</b>	<b>5.94</b>		1.32	1.45		0.306	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Protactinium-231	-1.02	U	3.64	3.64		2.97	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Radium-226</b>	<b>0.682</b>		0.165	0.179	0.700	0.0545	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Radium-228	0.164	U	0.297	0.298		0.254	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Thallium-208</b>	<b>0.186</b>		0.0708	0.0734		0.0275	pCi/g	08/06/18 17:13	08/27/18 08:00	1
<b>Thorium-228</b>	<b>0.596</b>		0.113	0.137		0.0514	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Thorium-232	0.164	U	0.297	0.298		0.254	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Thorium-234	-0.557	U	1.69	1.69		1.41	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Uranium-235	-0.0213	U	0.393	0.393		0.462	pCi/g	08/06/18 17:13	08/27/18 08:00	1
Uranium-238	-0.557	U	1.69	1.69		1.41	pCi/g	08/06/18 17:13	08/27/18 08:00	1

Client Sample ID: PE2-RSYE2-U12-LLRO-S004

Lab Sample ID: 160-29930-4

Date Collected: 07/26/18 12:52

Matrix: Solid

Date Received: 08/02/18 08:30

## Method: GA-01-R - Radium-226 &amp; Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.885</b>		0.236	0.253		0.0368	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Actinium-227	0.444	U	0.997	0.999		0.804	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Bismuth-212	0.588	U	1.04	1.04		0.806	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Bismuth-214</b>	<b>0.443</b>		0.170	0.176		0.0809	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Cesium-137	-0.0290	U	0.0876	0.0876	0.0700	0.0698	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Cobalt-60	0.0151	U	0.0988	0.0988	0.200	0.0484	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Lead-210	-1.03	U	2.32	2.32		1.94	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Lead-212</b>	<b>0.662</b>		0.120	0.139		0.0544	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Lead-214</b>	<b>0.705</b>		0.153	0.169		0.0632	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Potassium-40</b>	<b>9.93</b>		1.64	1.93		0.407	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Protactinium-231	0.442	U	1.75	1.76		2.76	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Radium-226</b>	<b>0.443</b>		0.170	0.176	0.700	0.0809	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Radium-228</b>	<b>0.885</b>		0.236	0.253		0.0368	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thallium-208</b>	<b>0.196</b>		0.105	0.107		0.0501	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thorium-228</b>	<b>0.662</b>		0.120	0.139		0.0544	pCi/g	08/06/18 17:13	08/27/18 07:59	1
<b>Thorium-232</b>	<b>0.885</b>		0.236	0.253		0.0368	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Thorium-234	0.108	U	0.379	0.379		1.40	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Uranium-235	0.0980	U	0.280	0.281		0.629	pCi/g	08/06/18 17:13	08/27/18 07:59	1
Uranium-238	0.108	U	0.379	0.379		1.40	pCi/g	08/06/18 17:13	08/27/18 07:59	1

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-380698/1-A**  
**Matrix: Solid**  
**Analysis Batch: 385326**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 380698**

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	-0.2161	U	0.375	0.376		0.194	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Actinium-227	0.02514	U	0.0828	0.0829		0.519	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Bismuth-212	-0.4299	U	0.997	0.998		0.754	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Bismuth-214	-0.03501	U	0.125	0.125		0.0948	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Cesium-137	-0.02740	U	0.0815	0.0816	0.0700	0.0368	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Cobalt-60	0.02188	U	0.0474	0.0475	0.200	0.0320	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Lead-210	-0.1217	U	0.794	0.794		0.987	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Lead-212	-0.07930	U	0.0934	0.0940		0.0875	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Lead-214	-0.06546	U	0.152	0.152		0.0875	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Potassium-40	-0.7702	U	0.665	0.669		0.813	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Protactinium-231	-0.7373	U	2.34	2.34		1.88	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Radium-226	-0.03501	U	0.125	0.125	0.700	0.0948	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Radium-228	-0.2161	U	0.375	0.376		0.194	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Thallium-208	0.004482	U	0.00743	0.00744		0.0380	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Thorium-228	-0.07930	U	0.0934	0.0940		0.0875	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Thorium-232	-0.2161	U	0.375	0.376		0.194	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Thorium-234	-0.6728	U	1.28	1.29		1.09	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Uranium-235	-0.07080	U	0.472	0.472		0.288	pCi/g	08/06/18 17:13	08/27/18 07:22	1
Uranium-238	-0.6728	U	1.28	1.29		1.09	pCi/g	08/06/18 17:13	08/27/18 07:22	1

**Lab Sample ID: LCS 160-380698/2-A**  
**Matrix: Solid**  
**Analysis Batch: 385345**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 380698**

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	96.8	98.40		10.4		0.620	pCi/g	102	87 - 116
Cesium-137	28.2	28.63		3.08	0.0700	0.111	pCi/g	102	87 - 120
Cobalt-60	12.8	12.80		1.36	0.200	0.0429	pCi/g	100	87 - 115

**Lab Sample ID: 160-29930-1 DU**  
**Matrix: Solid**  
**Analysis Batch: 385322**

**Client Sample ID: PE2-RSYE2-U12-LLRO-S001**  
**Prep Type: Total/NA**  
**Prep Batch: 380698**

Analyte	Sample Sample		DU DU		Total	LOQ	DLC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Actinium 228	0.803		0.7799		0.188		0.0541	pCi/g	0.06	1
Actinium-227	0.0506	U	0.1585	U	0.659		0.535	pCi/g	0.14	1
Bismuth-212	-0.673	U	0.0000	U	0.495		0.494	pCi/g	0.39	1
Bismuth-214	0.514		0.5934		0.138		0.0449	pCi/g	0.28	1
Cesium-137	0.0378	U	-0.01628	U	0.0630	0.0700	0.0508	pCi/g	0.41	1
Cobalt-60	0.00177	U	-0.04135	U	0.0903	0.200	0.0430	pCi/g	0.29	1
Lead-210	1.20		-0.3653	U	1.21		1.04	pCi/g	0.62	1
Lead-212	0.592		0.5843		0.116		0.0357	pCi/g	0.03	1
Lead-214	0.569		0.5597		0.116		0.0448	pCi/g	0.03	1
Potassium-40	9.55		9.621		1.60		0.243	pCi/g	0.02	1
Protactinium-231	-0.884	U	0.0000	U	0.701		2.11	pCi/g	0.22	1

## QC Sample Results

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

### Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID: 160-29930-1 DU**

**Matrix: Solid**

**Analysis Batch: 385322**

**Client Sample ID: PE2-RSYE2-U12-LLRO-S001**

**Prep Type: Total/NA**

**Prep Batch: 380698**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2 $\sigma$ +/-)	LOQ	DLC	Unit	RER	RER
										Limit
Radium-226	0.514		0.5934		0.138	0.700	0.0449	pCi/g	0.28	1
Radium-228	0.803		0.7799		0.188		0.0541	pCi/g	0.06	1
Thallium-208	0.227		0.2324		0.0619		0.0188	pCi/g	0.04	1
Thorium-228	0.592		0.5843		0.116		0.0357	pCi/g	0.03	1
Thorium-232	0.803		0.7799		0.188		0.0541	pCi/g	0.06	1
Thorium-234	0.919		-0.6924	U	1.46		1.18	pCi/g	0.58	1
Uranium-235	0.114	U	-0.1574	U	0.143		0.369	pCi/g	0.67	1
Uranium-238	0.919		-0.6924	U	1.46		1.18	pCi/g	0.58	1

## QC Association Summary

Client: Aptim Federal Services LLC  
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29930-2

### Rad

#### Leach Batch: 379958

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29930-1	PE2-RSYE2-U12-LLRO-S001	Total/NA	Solid	Dry and Grind	
160-29930-2	PE2-RSYE2-U12-LLRO-S002	Total/NA	Solid	Dry and Grind	
160-29930-3	PE2-RSYE2-U12-LLRO-S003	Total/NA	Solid	Dry and Grind	
160-29930-4	PE2-RSYE2-U12-LLRO-S004	Total/NA	Solid	Dry and Grind	
160-29930-1 DU	PE2-RSYE2-U12-LLRO-S001	Total/NA	Solid	Dry and Grind	

#### Prep Batch: 380698

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29930-1	PE2-RSYE2-U12-LLRO-S001	Total/NA	Solid	Fill_Geo-21	379958
160-29930-2	PE2-RSYE2-U12-LLRO-S002	Total/NA	Solid	Fill_Geo-21	379958
160-29930-3	PE2-RSYE2-U12-LLRO-S003	Total/NA	Solid	Fill_Geo-21	379958
160-29930-4	PE2-RSYE2-U12-LLRO-S004	Total/NA	Solid	Fill_Geo-21	379958
MB 160-380698/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-380698/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29930-1 DU	PE2-RSYE2-U12-LLRO-S001	Total/NA	Solid	Fill_Geo-21	379958